Wellington

PHOTOGRAPHIC HAND BOOK

A. Barclay
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ELEVENTH EDITION.

THE . .

Wellington

Photographic HANDBOOK

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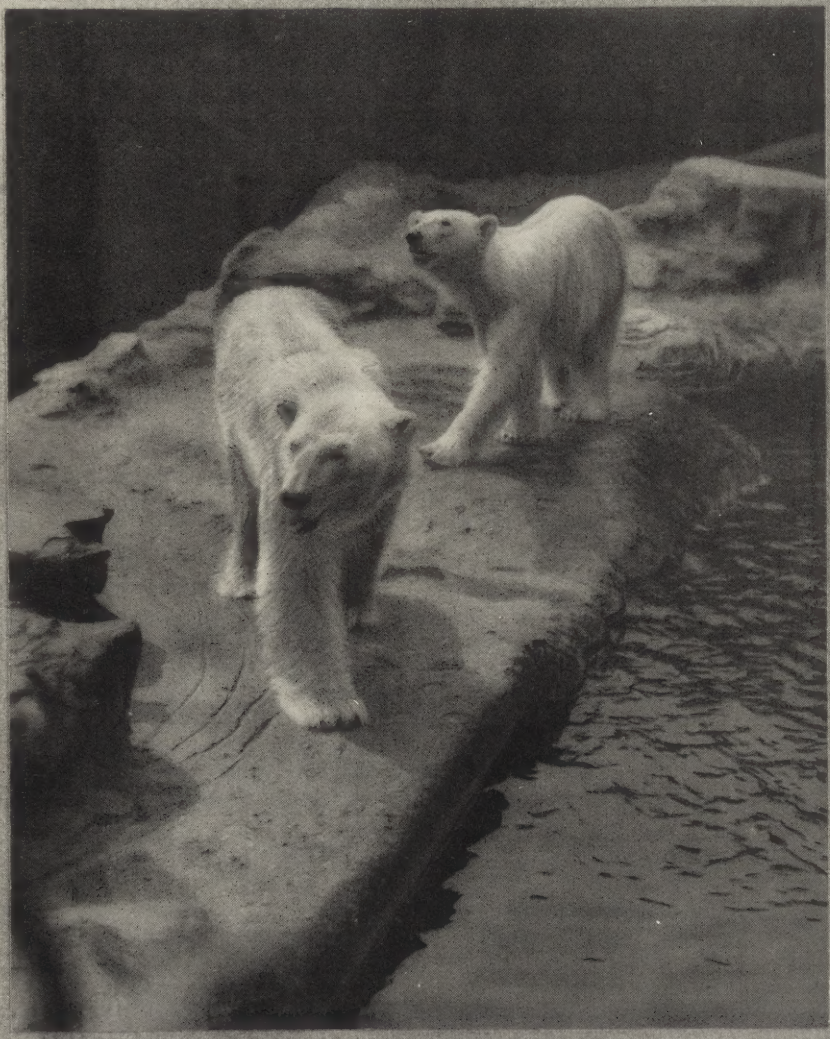

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Illustrations.

The half-tone negatives for the above illustrations were made on WELLINGTON Ortho Process Plates from prints on WELLINGTON Enammo or WELLINGTON Carbon Bromide.

PREFACE.

THE increased demand for the WELLINGTON Products and the introduction of several new grades of plates and papers, have rendered necessary the publication of yet another Edition of the WELLINGTON HANDBOOK—the eleventh.

Since the pre-war edition of this work was published a great advance has taken place in the application of photography to scientific, industrial and military purposes. In the prosecution of the war photography played a part which a few years ago no man would have thought possible, and it is safe to predict that in the future practically every industry will more or less be dependent upon its aid.

It is satisfactory to note that the Royal Academy has decided to admit photographs to its Architectural Section. This recognition of the artistic value of photography can hardly fail to meet with universal approval, for as a means of rendering delicate architectural detail, the camera undoubtedly surpasses the pencil or brush.

During the progress of the war, very heavy demands were made upon the output of our Factories by the Allied Governments. Notwithstanding many difficulties and the absence through military service of seventy-five per cent. of our original staff, we successfully met all requirements, and moreover effected valuable improvements in those materials manufactured for war and hospital purposes.

Our Factories, situated at Elstree, near London, where the pure, dust-free air affords ideal manufacturing conditions, continue to be under the personal direction of Mr. J. B. B. Wellington (Scientific Partner), Mr. H. W. Hall (Managing Partner), and Mr. H. H. Ward (Engineering Partner).

We should like in conclusion to thank our many friends at home and abroad for the kind letters of appreciation which so often reach us. Never a day passes without our receiving gratifying testimony to the value of our goods, and again and again prize winners in various competitions, and successful exhibitors in all parts of the world, attribute their success to the high quality of the WELLINGTON Products.

WELLINGTON & WARD.

Wellington Plates.

WELLINGTON PLATES are made under the most favourable conditions for securing the very highest quality of product.

Buildings specially constructed for the purpose are devoted to their manufacture, and the very latest and most approved methods, chemical and mechanical, are employed to ensure the plates being perfect in coating and uniform in speed and quality.

WELLINGTON PLATES are made in eleven varieties, for various requirements, each plate having an individuality of its own. The following list explains the special purposes for which each plate is intended.

I.—WELLINGTON 'XTREME PLATE.

This is the fastest of all the Wellington Plates and represents a great advance in modern dry plate manufacture. In addition to extreme sensitivity it possesses a degree of general good quality which can hardly be surpassed in a slower plate. It is particularly suitable for portraiture, whether by daylight or artificial light, and is strongly recommended for all purposes where very high speed, fine grain, good density-giving powers, and perfect gradation are required.

The speed is 400 H. & D., 350 Watkins, or F/128 Wynne.

2.—WELLINGTON 'XTRA SPEEDY PLATE.

The WELLINGTON 'XTRA SPEEDY PLATE is slightly slower than the 'Xtreme, but by reason of the readiness with which it gains density is to be preferred for hand-camera work. It gives brilliant negatives, free from hardness and of exceptionally fine grain. Even after prolonged development there is no tendency to fog. For the amateur, owing to its great latitude and the ease with which good results can be obtained, it would be hard to find a better plate, and for the professional photographer in need of a plate for all-round work it is equally suitable. To the advanced worker or the beginner we recommend the 'Xtra Speedy plate with confidence.

The speed is 350 H. & D., 300 Watkins, or F/111 Wynne.

3.—WELLINGTON PRESS PLATE.

The requirements of the press photographer differ in many respects from those of the ordinary worker. We have therefore produced for his use a plate embodying many special qualities. The delicacy of gradation demanded by the portrait photographer, is out of place in a negative intended for reproduction in a daily paper. What is here needed is detail, good contrast and rich shadows. The WELLINGTON PRESS PLATE gives a negative exactly fulfilling these requirements and renders easy the production of satisfactory results under the most adverse conditions. It develops, fixes, and dries very rapidly—another great convenience in press work where speed of production is such an important factor—and the tough emulsion with which it is coated is well calculated to withstand rough handling in the press photographer's dark-room.

In speed it is identical with the 'Xtra Speedy Plate, namely, 350 H. & D., 300 Watkins or F/111 Wynne.

4.—WELLINGTON ANTI-SCREEN PLATE.

Every photographer knows that an ordinary plate is almost completely insensitive to yellow, green and red. Consequently it renders those colours as black, or nearly so. The invention of the isochromatic plate somewhat remedied this defect, but the sensitivity to yellow and green was still so small in proportion to the sensitivity to blue and violet, that only by the use of a light filter to cut out the greater part of the blue and violet rays was the plate able to show any appreciable improvement in colour rendering. Moreover, the use of a light filter necessitated an increase in the exposure of some four or five times, and so the hand camera worker, whether he used ordinary or isochromatic plates, had still to be content with the old false colour-rendering, in which yellow, the most brilliant colour in nature, was rendered as only a few shades lighter than black.

The WELLINGTON ANTI-SCREEN plate is an isochromatic plate, but unlike an ordinary isochromatic plate is capable of giving an exceedingly fine rendering of the greens and yellows *without the use of a light filter.* In portraits, landscapes and seascapes, in flower studies and in architectural work, the problem of correctly rendering colour is always present, and always the Anti-Screen plate is capable of solving it satisfactorily. When the Anti-Screen plate is used in portraiture the work of retouching is reduced and a more perfect rendering of the hair and of flesh tones is secured.

It is a characteristic of the Anti-Screen plate that it is almost free from halation, even when used unbacked.

The Anti-Screen plate is only a little slower than the fastest plates made, and is therefore ideal for the hand camera. Provided with the Anti-Screen plate the photographer is able to deal successfully with almost any subject that may present itself, from a flower study to an aeroplane in flight.

The speed is 300 H. & D., 270 Watkins or F/105 Wynne.

5.—WELLINGTON ISO-SPEEDY PLATE.

This is an isochromatic plate of high speed and quality, intended for use with the " Wellington " light filter. Where a high degree of colour correction is not desired it can, of course, be employed like an ordinary plate without a light filter.

The speed is 275 H. & D., 245 Watkins or F/100 Wynne.

6.—WELLINGTON SPEEDY PORTRAIT PLATE.

Where very high speed is not required no better plate could possibly be used than the WELLINGTON SPEEDY PORTRAIT. Originally manufactured for use in the studio, it is equally suitable for general photography both indoors and out. In this plate the maximum of high quality has been attained, and without demanding special skill on the part of the user, it allows of the production of negatives characterized by remarkable richness of gradation and extreme fineness of grain.

The Speedy Portrait Plate is largely used in tropical countries.

The speed is 250 H. & D., 220 Watkins or F/90 Wynne.

7.—WELLINGTON ORDINARY PLATE.

There are many purposes for which so fast a plate as either of the foregoing is not required, and there are many who like a slow plate for its greater latitude, and for the stronger light which may be used in the dark-room. It is for these that the WELLINGTON ORDINARY PLATE is manufactured. For copying purposes and the making of enlarged positives and negatives it is admirably suited.

The speed is 125 H. & D., 100 Watkins, or F/64 Wynne.

8.—WELLINGTON ORTHO-PROCESS PLATE.

This plate is specially made for process workers, and will be found excellent both for line and half-tone work. Its orthochromatic properties and extremely fine grain, combined with its density-giving power, make it also of great value to the commercial photographer. For copying documents, blue prints, coloured diagrams, etc., it is, we believe, unequalled.

The speed is 100 H. & D., 80 Watkins, or F/56 Wynne.

9.—WELLINGTON X-RAY PLATE.

Intended exclusively—as its name implies—for X-ray work, this plate has achieved great success during the war. Its exceptionally high speed, and the beautiful quality of the radiographs which can be obtained by its use, have gained for it a high place in the appreciation of the medical profession and of radiographers all over the world.

A booklet dealing exclusively with the WELLINGTON X-RAY PLATE will be sent on request.

10.—WELLINGTON LANTERN PLATE.

This plate is recommended to those who require a lantern plate of medium speed. It is especially suited to the making of lantern slides by reduction, and may also be used for making enlarged transparencies for window decoration and similar purposes.

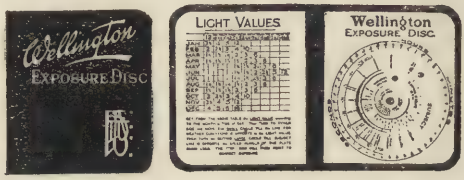
Cold black, warm black, brown and sepia tones may be obtained in development, and almost any colour by after toning.

The H. & D. speed is 6.

II.—WELLINGTON S.C.P. LANTERN PLATE.

The S.C.P. LANTERN PLATE is coated with the same emulsion as the WELLINGTON S.C.P., and can therefore be used in ordinary artificial light, a dark-room being quite unnecessary. By reason of its low speed it is especially suited for contact printing, but if a strong light (*e.g.*, daylight) is available it serves equally well for the production of lantern slides by reduction. A special feature of this plate is the exceptional brilliancy of the results obtainable and the fine range of pure tones from black to red which can be produced by simple development.

WELLINGTON EXPOSURE DISC.



A simple piece of apparatus for determining in a few seconds the exposure necessary for any subject, under all conditions of lighting, at any time of the year.

An Exposure Table for use with the WELLINGTON Plates will be sent free on request.

Wellington Plates

GENERAL REMARKS.

THE instructions which follow apply to all the different kinds of WELLINGTON Plates—except the Lantern Plates and S.C.P. Lantern Plates, which are dealt with separately on pages 98 to 110—and should be read through very carefully before any plates are used.

All photographic plates are extremely sensitive to light. The packets in which they are supplied must, therefore, be opened in the dark-room, and this room must be so lighted as to be reasonably safe. By this is meant that the lamp or window which serves to illuminate the room must be provided with a sheet of glass, or some other material, of such a colour as to absorb all the actinic rays and allow only those to pass which are incapable of fogging the plate. A piece of deep red glass, or better, one of red and one of yellow bound together, form a suitable filter for most plates ; or if preferred a sheet or two of special fabric, sold for the purpose by photographic dealers, may be sandwiched between two pieces of plain glass and used instead.

Daylight is not a good dark-room illuminant, as not only does its strength vary from hour to hour, but its actinic power is such that special filters are necessary to render it safe. Artificial light is much to be preferred in this respect, and, being constant, is less liable to lead to error in estimating density during development.

In buying a dark-room lantern the reader will be well advised to pay a fair price rather than content himself with a cheap article, which later on may cost him dear in fogged plates.

It should never be forgotten that a strong light at a distance of two or three feet is much safer than a weak light at a few inches from the plate. All light, even the deepest red, will affect a plate in time, so that care should be taken not to expose the plates unduly during manipulation.

Pieces of stiff card may be used to cover the dishes when developing, and it should be made a rule, especially with very fast plates like the 'Xtreme, 'Xtra Speedy and Anti-Screen, never to expose them to the dark-room light except during the few moments when the progress of development is being noted.

FILLING DARK SLIDES OR CARRIERS.

When loading the dark slides or camera the light must never be allowed to fall on the plates. To avoid this the worker should place himself so that his body intercepts the direct rays of the lamp. The plates will be found packed in pairs, face to face, the sensitive surface of each being turned inwards. They should not be dusted when putting them in the slides, as this only electrifies their surface and attracts dust. When only a few have been taken out of the cardboard box in which they are supplied, the box should be wrapped up before being removed from the dark-room, and should not be relied upon, of itself, to keep the plates within it protected from light.

EXPOSURE.

Those who have already mastered the difficulty of ascertaining the correct exposure will not go wrong if they treat the 'Xtreme, 'Xtra Speedy and Anti-Screen plates as the fastest made. For hand-camera work, with 'Xtra Speedy or Anti-Screen plates in the camera, anything that is possible at all, photographically speaking, can be secured. At the same time, these plates being very richly coated, and possessing great latitude, the very briefest exposure should be given only when such is absolutely necessary. More plates are wasted from under-exposure than from all other

causes put together. For those who have not yet learnt how to expose correctly, the WELLINGTON EXPOSURE DISC is recommended. This will be found the simplest and easiest "short-cut." If the H. & D., Watkins', or Wynne's systems are preferred, there is no reason why they should not be employed.

THE DEVELOPER.

Any of the developing substances on the market will give excellent results with WELLINGTON Plates if used in correct proportions and in solutions of suitable strength. Both pyro-soda and metol-hydrokinone will be found very suitable. Pyro-ammonia —although not recommended to the beginner—may be used if preferred. The following are the formulæ recommended :—

PYRO-SODA.*

	No. 1.	
Pyrogallic Acid ...	... 1 ounce	50 grammes
Sodium Sulphite (cryst.)	... 2 ounces	100 ,,
Citric Acid	... 40 grains	4·5 ,,
Water to	... 10 ounces	500 c.c.
	No. 2.	
Sodium Carbonate (cryst)	... 8 ounces	100 grammes
Sodium Sulphite (cryst)	... 8 ,,	100 ,,
Water to	... 80 ,,	1 litre

For Normal Work take 1 ounce (30 c.c.) of No. 2 and 1 dram (4 c.c.) of No. 1, with Water 1 ounce (30 c.c.).

For Studio Work take 1 ounce (30 c.c.) of No. 2 and ½ dram (2 c.c.) of No. 1, with Water 1 ounce (30 c.c.).

ONE SOLUTION METOL-HYDROKINONE.*

Metol	... 20 grains	1 gramme
Hydrokinone	... 60 ,,	3 grammes
Sodium Sulphite (cryst.)	... 700 ,,	35 ,,
Sodium Carbonate (cryst.)	... 700 ,,	35 ,,
Potassium Bromide ...	... 6 ,,	0·3 gramme
Water to	... 20 ounces	500 c.c.

Dissolve in the order given, allowing each chemical to be in complete solution before adding the next. In well-stoppered bottles this developer keeps almost indefinitely. For use dilute with an equal quantity of water.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and in very cold solutions becomes practically inert.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

PYRO-AMMONIA.*

	No. 1.	
Pyrogallic Acid	1 ounce	50 grammes
Sodium Sulphite (cryst.) ...	2 ounces	100 ,,
Citric Acid	40 grains	4·5 ,,
Water to	10 ounces	500 c.c.
	No. 2.	
Ammonia ·880	1 ounce	50 c.c.
Water to	10 ounces	500 c.c.
	No. 4.	
Ammonium Bromide	1 ounce	50 grammes
Water to	10 ounces	500 c.c.

Take 10 drops of No. 1, 10 drops of No. 2, and 5 drops of No. 3 to each ounce (30 c.c.) of Water.

COMPOUNDING THE DEVELOPER.

In making up the pyro-soda formula the sulphite and citric acid should be allowed to dissolve in from 4 to 5 ounces of hot water. When cool the pyro should be added, and the solution diluted with cold water to make 10 ounces in all. It will keep all the better if it is made up with water that has been boiled briskly and allowed to get cold without agitation. The carbonate and sulphite solution can be made with hot water also. Neither must be used until quite cold. In a well-corked bottle, the pyro solution will keep for a couple of months at least, and as long as it shows no more than a slight yellow discoloration may be regarded as in good working order. An old No. 2 solution tends to give yellow negatives.

If preferred potassium metabisulphite may be substituted for citric acid and sodium sulphite as the preservative in the pyro solution. Sixty grains should be dissolved in cold or warm—not hot—water, and the pyro added as described above.

Water previously boiled should also be used for mixing the metol-hydroquinone developer. It is important that the metol should be completely dissolved before the other ingredients are added. Metol does not readily dissolve in the presence of sodium sulphite and any undissolved particles will probably remain in suspension until they become deposited upon the plates during development, giving rise to a plentiful crop of black spots. Warm water is to be preferred for making up the solution.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

THE WELLINGTON BORAX-M.Q. DEVELOPER.

The following metol-hydrokinone developer in which borax replaces the usual alkali will be found of great value. Probably no developer is capable of giving negatives of such fine grain or more completely free from fog or stain. Its advantages are most marked in the development of very small negatives of the Verascope type, positives from which are generally produced by enlargement or viewed by magnification. In such cases the almost grainless quality of the original image is of the highest value. Borax-M.Q. gives negatives of delicate, rather than strong gradation, and of beautiful photographic quality. It works best with plates which have been fully exposed.

BORAX-M.Q.*

Metol	... 20 grains	1 gramme
Hydrokinone	... 50 ,,	2·5 grammes
Sodium Sulphite (cryst.)	... 200 ,,	10 ,,
Borax (powdered) ...	... 200 ,,	10 ,,
Water (hot)	... 20 ounces	500 c.c.

Dissolve in the order given, allowing each chemical to be in complete solution before adding the next. This developer keeps almost indefinitely in well-stoppered bottles.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

DEVELOPING.

The plate should not be soaked in water before developing. The developer should be mixed in a cup or measure with a wide mouth and poured over the plate with an even sweep, not splashed on. With some waters a slight scum forms when water is added to the Pyro developer, and if left standing in the cup this scum will rise to the surface and may adhere to the plate when it is poured on, giving rise to marks for which there will be no remedy. In places where this is noticed the two solutions must only be mixed the moment before use. After developing a plate with pyro-soda the developer should be thrown away. When metol-hydrokinone is used the same solution may be made to serve for two or more negatives developed in succession, but it must be remembered that with each plate developed the solution loses activity. It is

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

poor economy to save developer at the cost of spoiled plates. During development the dish should be rocked gently, not violently from time to time, and should be kept covered, except when the plate is being examined.

DEVELOPMENT BY THE WATKINS METHOD.

While the practised photographer will have no trouble in deciding how far to carry development, the beginner will be in considerable doubt, and without some guide may find himself spoiling what might otherwise be a good negative. The Watkins system affords this guidance, and if the exposure has been anything like correct can be relied upon to give good results. To put this method into practice with the "normal" pyro-soda formula given on page 13, the time in seconds is noted between the moment when the developer is poured on the plate and the moment when the first sign of the image appears. The time so taken is multiplied by ten, and the result is the total time, from the commencement, that the plate should remain in the developer. There is no need to hurry over the calculation. Make a note of the time by the watch when the developer is poured on, and as soon as the image begins to appear again note the time. The dish is then covered with a card to protect the plate from light, and while development progresses the time at which it will be finished is worked out. When such time is reached the plate is removed from the developer. If the "factor" ten gives a negative that is more vigorous than is desired, nine or eight may be used in the same way, or *vice versa*, twelve or even fourteen may suit some workers. Whatever the method of development, the dish should be gently rocked from time to time.

EXAMPLE.—*If thirty seconds elapsed between pouring on the developer and first seeing any sign of the image, development will be complete in ten times thirty seconds altogether, that is in* 300 *seconds, or* 5 *minutes.*

TIME DEVELOPMENT.

Time development, pure and simple, is based on the principle that with a given make of plate, the time required by a given

developer to produce a given type of negative is determined by the temperature. With WELLINGTON 'Xtra Speedy Plates and the Pyro-Soda Developer given on page 13, development is complete in three minutes at a temperature of 70° Fahr., in three and a half minutes at 65° Fahr., and in five minutes at 60° Fahr. These times are subject to slight modification according to the character of negative desired.

WELLINGTON Plates are admirably adapted for time development in the tank. The following formula is recommended :

PYRO-SODA.*

	No. 1.	
Pyrogallic Acid	1 ounce	50 grammes
Sodium Sulphite (cryst.) ...	2 ounces	100 ,,
Citric Acid	40 grains	4·5 ,,
Water to	10 ounces	500 c.c.
	No. 2.	
Sodium Sulphite (cryst.) ...	8 ounces	100 grammes
Sodium Carbonate (cryst.) ...	8 ,,	100 ,,
Water to	80 ,,	1 litre

The developer is made by taking half an ounce (12·5 c.c.) of No. 1, four ounces (100 c.c.) of No. 2, 20 minims (or drops) of a 10% solution of Potassium Bromide, and diluting to make 40 ounces (1 litre).

TIME AND TEMPERATURE TABLE.

	55°F.	60°F.	65°F.	70°F.
'XTREME Plate	35	29	25	21 minutes
'XTRA SPEEDY Plate ...	32	26	22	18 ,,
PRESS Plate	31	25	21	17 ,,
ANTI-SCREEN Plate	30	24	20	16 ,,
ISO SPEEDY Plate	30	24	20	16 ,,
SPEEDY PORTRAIT Plate ...	27	22	18	14 ,,
ORDINARY Plate	23	18	14	10 ,,

The following points require careful attention if plates are to be developed successfully by this system. The developer must be made up accurately, as slight alterations in its composition may considerably alter the time required. The temperature should be taken after mixing and immediately before use. No attempt must be made by the addition of hot or cold water to bring the solution to any particular temperature, as such temperature will not be maintained, unless it happens also to be the temperature of the room. A thermometer, with its scale engraved on the stem or enclosed in the glass, should be used, and should be left in the

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

solution for half a minute or so before the reading is noted. If the temperature is not exactly either of those given in the above table but something intermediate, an intermediate time should be given.

The time mentioned in each case is that which should elapse between pouring on the developer and putting the plates in hypo, as development does not cease as soon as the developer is poured off and the plates are rinsed, but will be found to continue even when the plates are placed in plain water.

Different workers have different views as to the precise density that their negatives should possess; different printing processes call for differences in contrast, and some classes of subjects are better for being a little softer or stronger than others. Portraits, for example, are all the better for being thinner than landscapes. The figures given, therefore, must be regarded as approximate. They form a good guide for the beginner, since they at least indicate much more correctly than he could hope to find out by examination, when to stop development. The more advanced worker, who has his own views as to the degree of contrast he should obtain, may wish to develop for a little longer or a little shorter than the time stated, and there is no reason why he should not do so.

Fresh developer must, of course, be used for each lot of plates. The developing tank should be reversible. It is important to reverse the tank after the developer has been acting for a minute or two, and to divide the remainder of the time into three or four equal parts, reversing the tank at the end of each period. If this is not done, it may be found that there are streamers of extra density proceeding from the thinner parts of the plate, and the negative will be useless.

FIXING.

When development is finished, the plate should be rinsed for a moment in clean water or under the tap and then placed in either of the following baths :—

FIXING BATH.*

Hypo	4 ounces	100 grammes
Water to	20 ,,	500 c.c.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

ACID FIXING BATH.*

Hypo	4 ounces	100 grammes
Potassium Metabisulphite ...	200 grains	13 ,,
Water to	20 ounces	500 c.c.

If perfectly clean negatives are required, the plate should not be exposed to anything but the red light until fixing is complete, and the hypo bath should be fresh. Fixing should be continued until all the white appearance has gone from the back of the plate, and *for as long again.* The Acid Fixing Bath tends to give cleaner negatives than those obtainable when a plain fixing solution is used.

In temperate climates there is no need to use a hardening bath with WELLINGTON Plates. If any difficulty is experienced with frilling or blistering the reader should study the notes on pages 49 and 50, which apply equally to plates and bromide paper.

WASHING.

The simplest way to wash a single negative is to place it on some support smaller than itself underneath the tap, and let a gentle stream of water flow over the whole surface for half an hour. Several negatives may be washed by hand in flat dishes in the same space of time, by continually changing the water, draining the plate well and rinsing the dish at each change. At least a dozen changes should be given, allowing the plate to remain in each for a couple of minutes. Any good automatic washer can of course be used, and in this the plates will require very little attention.

With most waters, a fine deposit of lime accumulates on the surface of the plate during washing. It does no harm, but is unsightly. It is removed by holding the plate film upwards under the tap for a moment when washing is finished, and gently rubbing the surface with a piece of wet cotton wool, taking care, of course, not to scratch the tender surface of the film.

DRYING NEGATIVES.

Negatives dry quickest in a current of dry air. No attempt should be made to dry them by heat. The grooves in most grooved drying racks are much too close together, and at least an inch should be left between each plate in the rack.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

Few people varnish their negatives and for ordinary work on WELLINGTON papers, there will be found little need for this operation. Varnishing, however, should be regarded as essential in the case of negatives that are to be kept for a long period or from which many prints are likely to be required.

TO TEST THE SUITABILITY OF LIGHT AND DEVELOPER.

When the negative is finished and dry, it may be placed film downwards on a piece of white paper. Those parts which were protected by the edges of the sheath or dark slide, and so received no exposure to light in the camera, should only be very lightly greyed over. If the plate was unbacked the edges where they come against the sky are almost sure to be greyed, but the other edges where they border on the landscape, and particularly on shadows, ought to be quite clean. If there is anything like a notable deposit on them, that is to say, if the edges are not nearly clear glass, it is a sign that the plate has been fogged from one or more of the following causes :—

An unsafe dark-room light.

Undue exposure of the plate to the dark-room light during development or when loading the slides. (A light, perfectly safe if used with care, will often cause fog in the hands of a worker who exposes his plates recklessly during manipulation.)

An unsuitable developer.

The use of the developer at too high a temperature. (From 60° to 65° Fahr. is a good temperature for development, and although WELLINGTON plates will stand warmer solutions than this, it is better to err on the safe side.)

Whether correctly or incorrectly exposed the plate should pass this test. Every batch of WELLINGTON Plates before it leaves the factory is thoroughly tested, and found clean working, and the simple trial mentioned in this paragraph will enable the beginner to make sure that his light and solutions are correct.

WELLINGTON Iso-Speedy Plates.

It is not every photographer who is satisfied with the rendering of colours given by plates of the ordinary or non-isochromatic kinds. Everyone knows that certain colours are said to " photograph light " and others to " photograph dark." Blue, especially a pure blue, will seem very much lighter in a photograph than it is in reality, while yellow, red and green will often photograph very much darker than they appear to the eye.

We may have two objects side by side, a red and a blue. No one looking at them could doubt for a moment that the blue was much darker than the red, yet in the photograph the blue may seem much the lighter. In the same way, a person's skin may be smooth, and to the eye may appear very much the same tint all over, yet actually there may be, in fact there often are, faintly visible yellow or reddish freckles ; and when such a person is photographed, these freckles—on account of their colour—appear very strongly in the print. Much retouching is necessitated by this peculiarity of ordinary plates. In landscape work, a great deal of the beauty of many pictures is due to the different shades of green in the foliage, and to the masses of white cloud against the deep blue of the sky. An ordinary plate renders the greens too much alike, and all of them too dark, while the blue of the sky is rendered no darker, and sometimes even lighter, than the white clouds. In copying paintings, and in the photography of flowers, the same difficulties are met with.

All this takes its origin in the fact that ordinarily a plate is not sensitive to red, is only slightly sensitive to yellow or green, and is quite disproportionately sensitive to blue and to violet. The WELLINGTON Iso-Speedy Plates have been treated in a special manner to overcome this defect.

It should here be pointed out that it is by no means every subject that is the worse for this defect of ordinary plates. Many photographers hold that for all ordinary subjects, portraits, landscapes and architecture, an isochromatic plate is not an advantage. They claim that there is a certain " quality " about the results

obtained on ordinary plates, which cannot readily be secured with isochromatic plates. Therefore, they use isochromatic plates only when the subject seems specially to call for them. Others use them on every possible occasion, and consider that they invariably give a better result, even without a screen. It is very largely a question of personal taste, at least as far as the ordinary run of photographic work is concerned ; but there are some cases, as has been shown, in which there can be no possible doubt of the advantages of the isochromatic plate.

Mention has just been made of the " screen " or " light filter," and this calls for some explanation. It has been pointed out that ordinary plates are only very slightly sensitive to red, yellow and green, but too much so to blue. This can be partly remedied, but only partly, by the isochromatic process ; and in consequence, WELLINGTON Iso-Speedy plates are much more sensitive to yellow and green than, for example, WELLINGTON 'Xtra Speedy plates. Neither are sensitive to red, as it is found that in all ordinary photography little is gained by making a plate red-sensitive, while it makes its manipulation much more difficult, since it is then so easily fogged by the dark-room light. But though the WELLINGTON Iso-Speedy plates are thus made sensitive to yellow and green, they are still too sensitive to blue and violet to give a truthful result, and so when it becomes important to secure this, the photographer slips over or into his lens a specially prepared yellow glass of film called a colour screen or light filter. This yellow screen absorbs some of the blue and violet rays, while not interfering with the yellow and green, and its action, combined with the isochromatizing of the plate, enables the result in every case, with the exception of the reds, to be an accurate rendering.

The WELLINGTON Light Filter.

The WELLINGTON Light Filter has been carefully adjusted for use with the WELLINGTON Iso-Speedy and Ortho Process plates. It increases the exposure with those plates to five times that which they need without the light filter.

It is sometimes asked whether a light filter can be used to advantage with ordinary plates. It certainly slightly improves the colour rendering, but since it cuts off most of the light except the yellow and green, to which ordinary plates are only slightly sensitive, it prolongs exposure to such an extent as to make its use prohibitive. A WELLINGTON Light Filter, for example, which with a WELLINGTON Iso-Speedy plate necessitates only five times the exposure, with a WELLINGTON 'Xtra Speedy might require as much as several hundred times the exposure. So that a light filter can only be used to advantage with an Iso plate.

Moreover, if the advantage is to be secured with as little prolongation of the exposure as possible, the light filter employed must be adjusted to the plate itself, and its strength—" five times " or what not—only holds good for that particular plate. A " five times " light filter with one plate may very well become a " ten times " light filter with another. An Isochromatic plate will give a better rendering with any commercial yellow colour screen than without it, but to get that improvement without the exposure being needlessly long, the colour screen must be adjusted to the plate.

It is a moot point with photographers whether a light filter should always be used with an Iso plate or not. Some say that there is little or no advantage in using an Iso plate at all, unless a light filter is also used. Others hold that even without a light filter, the improvement is sufficiently marked in almost all cases to justify the use of Iso plates. Again, personal taste must decide.

Good advice to the photographer is to start with ordinary plates, since not being so sensitive to the light they are more easily handled in the dark-room. Then, when he feels fairly familiar with them, let him pass to the use of Iso plates and of the light filter, and decide for himself whether the more faithful colour rendering pleases him better.

There can be no question about the alteration when the light filter is employed ; but in many cases it lengthens the exposure

too much. The hand-camera worker can only rarely use it on this account, and it is hardly practicable for portraiture, except out of doors. But for all subjects containing colour, where the lengthened exposure does not matter, such as in the case of landscapes, architectural and flower subjects, and picture copying, the WELLINGTON Iso-Speedy plate and WELLINGTON Light Filter will be found an ideal combination.

It is a good rule always to focus after putting the screen in position, to make quite sure that nothing has been shifted in so doing. The exposure for the plate is ascertained with the meter or WELLINGTON Exposure Disc, in the usual way, and is then multiplied by five.

Towards sunset, and at other times if the light is distinctly yellow in colour, it will be found necessary to multiply only by two or three. This is a case in which experience alone can be a reliable guide ; but there is not likely to be much trouble on this score.

In the dark-room the treatment of WELLINGTON Iso Speedy plates is precisely the same as that of WELLINGTON 'Xtra Speedy plates. The same developer is used, in the same way. The same red light will do for both, but in the case of the Iso Speedy it is even more important to keep the dish covered and not to expose to the red light more than is strictly necessary.

It will be noticed that the speed numbers of the Iso-Speedy are less than those of the 'Xtra Speedy. This is inevitable, as the isochromatizing has a slight slowing action, but not enough to be more than just appreciable.

There is one caution which it is important to give. If the best rendering with the Iso-Speedy plate and yellow screen is to be secured, the plate must not be under-exposed and then over-developed. Such a result gives an apparent over-correction, which manifests itself in a " snowiness " over the scene. Full exposure, and sufficient but not excessive development are necessary if the plate and screen are to be used at their best.

The WELLINGTON Anti-Screen Plate.

The reader who has perused the notes on page 7 will need little additional information regarding the Anti-Screen Plate. It will have been seen from the foregoing remarks concerning the Iso-Speedy Plate and the Wellington light filter that to obtain any appreciable benefit from the use of an ordinary isochromatic plate a light filter must be used, and the exposure increased from two to five times, according to the depth of the filter employed.

The WELLINGTON Anti-Screen plate is an isochromatic plate, but unlike isochromatic plates generally, it has the power of giving an excellent rendering of the yellows and greens *without the use of a light filter.*

It will therefore be seen that the Anti-Screen plate brings the advantage of isochromatic photography within the reach of the hand-camera worker, who can only rarely afford the long exposure rendered necessary by the use of a light filter. It brings isochromatism also to the help of the portrait photographer and allows of his securing portraits in which the hair and the texture of the skin are rendered far better than would be possible with an ordinary plate, his negatives in consequence requiring less re-touching. What is even more important to the general worker is the fact that with the Anti-Screen plate he is able to deal efficiently with any subject that may present itself.

At the end of the day, when the light begins to grow yellow and an ordinary plate becomes almost useless, the Anti-Screen plate, by reason of its sensitiveness to yellow light, seems to gain in speed, and thus becomes of increased value to the photographer who desires to record the effects of light and shade which are so charming to the eye in the early evening.

Finally, the peculiar character of its coating renders the Anti-Screen plate almost free from halation even when used unbacked.

The Anti-Screen plate is developed in precisely the same way as the Iso-Speedy plate.

WELLINGTON Ortho Process Plate.

This plate is specially made for process workers, for whom it is very suitable owing to its extremely fine grain, its general cleanliness, and its orthochromatic qualities. It is also of the highest value for copying purposes and for all photographic work where a colour-sensitive plate giving great density is required. Its manipulation does not differ from that of the other WELLINGTON Plates.

Any of the developers previously mentioned will be found suitable.

The following is recommended where great contrast is required. It should not be used at a temperature below 60° Fahr.

HYDROKINONE.*

Hydrokinone	80 grains	5 grammes
Sodium Sulphite (cryst.) ...	1 ounce	30 ,,
Potassium Hydrate	80 grains	5 ,,
Potassium Bromide	10 ,,	0·6 gramme
Water to	20 ounces	500 c.c.

HALATION.

Mention has been made in the preceding pages of " halation " and " backed " plates. These terms require a little explanation.

The beginner at photography will soon discover that when he photographs subjects in which there are deep shadows and very bright high-lights his negatives show the high-lights spread beyond their proper boundaries and consequently blotting out the details of the surrounding parts. This is particularly noticeable in photographs of interiors in which windows appear, or in the case of landscapes where trees stand out against a bright sky. This spreading of the high-lights is termed " halation " and is due to the fact that the bright light is not wholly absorbed by the film, but in part passes through, and reaching the back of the plate, is reflected at an angle upon the underside of the film.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

To prevent this defect, plates may be obtained with the glass side covered with a coating capable of absorbing the light that passes through the film and preventing its reflection. A plate so prepared is called a " backed " plate.

WELLINGTON plates are backed with a red transparent medium which is practically invisible in the dark-room and allows the progress of development to be watched by transmitted light just as readily as if the plates were unbacked.

This backing should not be sponged off, as is necessary with ordinary opaque backing. The plate should be treated in the usual way, and it will be found that the operations of development and fixation will cause the backing entirely to disappear. The dissolution of the backing causes the developer to assume a deep red colour, but its activity is in no way diminished, and the red stain has the effect of protecting the plate from any fogging action of the dark-room light.

It should here be mentioned that the extent to which an unbacked plate is liable to halation is largely determined by the nature and richness of its coating. WELLINGTON plates are famous for their thick, rich coating, and their consequent freedom from halation. The reader will therefore find that for most ordinary purposes he can safely use his plates unbacked, but when photographing interiors, backed plates should always be used.

The WELLINGTON Silver Intensifier.

Negatives which are not sufficiently vigorous owing to some error in manipulation, such as over-exposure or under-development, may be greatly improved by the process of intensification.

The film should first be hardened in the following bath :—

Formaline	1 part
Water	10 parts

In this bath the negative should be allowed to remain for five minutes, after which it should be rinsed for a few minutes and then placed for exactly one minute in the following bath :—

Potassium Ferricyanide ...	20 grains	2·3 grammes
Potassium Bromide	20 ,,	2·3 ,,
Water to	20 ounces	1 litre

This bath, which should never be omitted, has the effect of preventing stains during the process of intensification.

Too long an immersion in this bath causes the image to bleach, which should be avoided if it is desired to retain the original gradation. In the time prescribed there is no apparent change, but the clearing agent has done its work. The negative should now be rinsed for a few minutes and then intensified in the following :—

STOCK SOLUTIONS.

A.

Silver Nitrate	800 grains	91·2 grammes
Distilled water to	20 ounces	1 litre

B.

Ammonium Sulphocyanide ...	1400 grains	160 grammes
Hypo	1400 ,,	160 ,,
Water to	20 ounces	1 litre

(Both solutions keep indefinitely.)

Half an ounce of A should be taken and added to half an ounce of B, stirring vigorously with a glass rod. The solution should be quite clear ; if the stirring is omitted it is apt to be turbid. To this solution should be added 1 dram of a 10 per cent. solution of Pyro preserved with Sulphite, and 2 drams of a 10 per cent. solution of Ammonia. The negative should be placed in a chemically clean dish and the silver solution poured over it. In a minute or two the deposition of the silver begins to take place, and as soon as sufficient density has been acquired the negative should be placed in an acid fixing bath until the slight pyro stain is removed. After this bath the negative should be well washed ; during washing it is as well to rub the surface of the film with a tuft of cotton wool to remove the slight surface deposit which will be found upon it.

It is important that the negative to be intensified should have been thoroughly fixed in a clean fresh hypo bath, and not merely have been left for some indefinite period in a stale or dirty solution of hypo that has been used on other occasions.

It the original negative is flat from over-exposure, greater contrast may be obtained by over-intensification and subsequent reduction with Farmer's reducer (see next page).

It is not an everyday occurrence that a negative requires strengthening, but when the necessity does arise, with the above stock solutions at hand it is only a matter of a very few minutes to carry out the desired improvement. The work may be done on the lines indicated with the certainty that the solutions used have not deteriorated and without any risk of failure from staining.

THE CHROMIUM INTENSIFIER.

This intensifier is simple in use and is a favourite with many workers. Two solutions are required.

A.

Potassium bichromate	1 oz.
Water to	25 oz.

B.

Hydrochloric acid	½ oz.
Water to	25 oz.

For use mix equal parts of A and B.

The negative is bleached in the mixture, washed until the yellow bichromate stain has disappeared and is then darkened in a strong developer containing no bromide. The amidol formula given on page 67, with the bromide omitted, will be found very suitable. If still more density is required the operation may be repeated.

After darkening the negative should be washed for ten minutes.

REDUCTION.

Negatives which are unduly dense may be reduced in what is known as Farmer's Reducer. This is made as follows :—*

Potassium Ferricyanide ...	120 grains	7 grammes
Water to	20 ozs.	500 c.c.

A dram or two of this is added just before use to each ounce of ordinary hypo solution. The negative is immersed in the reducer until it is seen to be *nearly* sufficiently reduced in density and is then well washed. Negatives that have been dried must be well soaked before treatment. During the process of reduction the dish must be steadily rocked.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

Wellington

Transparent Films.

Celluloid,
Anti-Curling.

Isochromatic.

GENERAL REMARKS.

WELLINGTON Roll Films are the result of many years of careful experimenting, the object being to make a film as perfect and as rapid as possible. The film is transparent, without joins in the raw material, and is coated with an emulsion of high speed and perfect quality.

In all cases it will be found advisable to develop roll films in the length ; a flat dish or a developing tank can be used with equal success. The rolls can easily be handled in 12-exposure lengths up to 5×4 size. In the larger sizes they may be cut off at the six exposures and developed half at a time. All roll films are sent out in such form that they can be used in a developing machine if this method is preferred.

If it is desired to develop each exposure separately the film and the black paper should be taken out *exactly together*, and cut at the cutting marks on the black paper. That is to say, when the black paper has been unwound until the film appears, film and paper should be kept together by holding them firmly, running

the two together between the fingers so as to make sure that one does not slip beyond the other. By doing this there will be no risk of cutting the film at the wrong place. Errors in cutting are caused by the black paper, which, of course, is larger in circumference, winding out faster than the film. If the two are kept together and cut as above mentioned there will be no fear of a mistake.

N.B.—Care must be taken to see that the end of the film, when cutting up, does not roll up over the paper as shown in the diagram below.

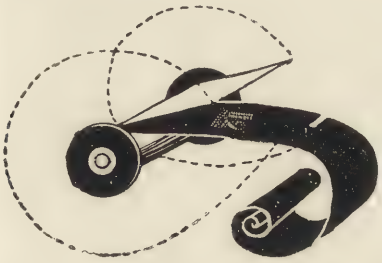


Fig. 1.
INCORRECT.

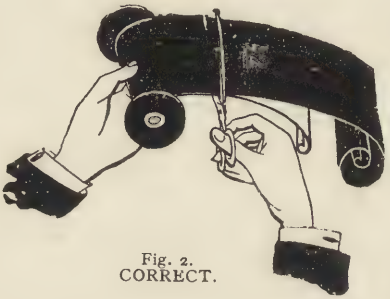


Fig. 2.
CORRECT.

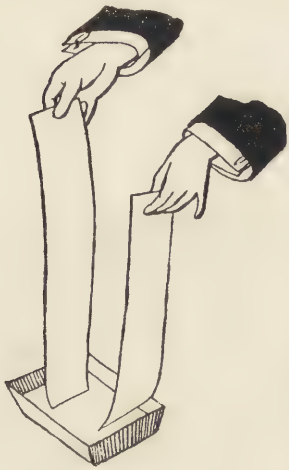
ILLUMINATION OF THE DARK-ROOM.

The light which is safe for WELLINGTON Anti-Screen Plates will be found most suitable for WELLINGTON Films. It must be remembered, however, that in developing films in the length, they are exposed to the light for the whole time of development. The lamp, therefore, should be turned down or moved so that it does not shine directly on the film. This, of course, does not apply to machine development.

THE DEVELOPMENT OF FULL LENGTHS.

When the film is to be developed in the full length, it must first be removed entirely from the black paper, and should then be soaked in clean cold water. The simplest method of doing this is shown in the diagram. The water being placed in a dish,

the two ends of the film are held in the two hands, or by means of " bull-dog " clips, which will be found very convenient, and with the coated surface of the film inwards, the loop of film is passed through the water backwards and forwards by raising one hand and lowering the other.



When the film is quite limp, it may be transferred to a dish of developer, and developed in exactly the same manner. While in the developer, it should be moved fairly quickly in order to make the development as even as possible. If the exposures have been approximately correct, the high-lights will soon appear, and the image will gradually grow in density until development is complete. If the exposures have not been correct, the film may be cut up into the separate exposures and each treated at the fancy of the worker.

DEVELOPMENT OF CUT PIECES.

It is not recommended that the films be cut up before development, but they can be treated in this way if desired (see diagrams), and then developed in the same way as plates. As they are coated on both sides with gelatine, it is necessary to allow each piece to soak in water until it is limp, in order to prevent the films from adhering to each other or to the bottom of the dish. When films are to be developed in this way, it will be found advisable to round off the otherwise sharp corners of each piece with the scissors to prevent them from abrading each other. Two or three films may be developed in one dish at the same time, but they must be kept moving, the bottom one being continually brought out and placed on the top. If many are in the dish at once there is a great risk of development being uneven, and three should be regarded as the maximum for development with safety.

THE DEVELOPER.

Any of the standard developing substances on the market will give good results with WELLINGTON film if the strength of the solutions in which they are used has been correctly adjusted. Pyro is as good a developer as any, the pyro-soda formula which is recommended for WELLINGTON Plates being the most suitable. Metol-hydrokinone also gives excellent results.

PYRO-SODA.*

No. 1.

Pyrogallic Acid	1 ounce	50 grammes
Sodium Sulphite (cryst.) ...	2 ounces	100 ,,
Citric Acid	40 grains	4·5 ,,
Water to	10 ounces	500 c.c.

No. 2.

Sodium Carbonate (cryst.) ...	8 ounces	100 grammes
Sodium Sulphite (cryst.) ...	8 ,,	100 ,,
Water to	80 ,,	1 litre

Take 1 ounce (30 c.c.) No. 2, 1 dram (4 c.c.) No. 1. Water 1 ounce (30 c.c.).

METOL-HYDROKINONE.*

Metol	20 grains	1 gramme
Hydrokinone	60 ,,	3 grammes
Sodium Sulphite (cryst.) ...	700 ,,	35 ,,
Sodium Carbonate (cryst.) ...	700 ,,	35 ,,
Potassium Bromide	6 ,,	0·3 gramme
Water to	20 ounces	500 c.c.

Dissolve in the order given, allowing each ingredient to be in complete solution before adding the next. For use dilute with an equal quantity of water.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° hydrokinone rapidly loses its developing power, and at very low temperatures becomes practically inert.

The method of making up these developers is given on page 14.

TIME DEVELOPMENT IN THE TANK.

WELLINGTON Films are admirably adapted for time development in the tank. The following formulæ are recommended :—

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

PYRO-SODA.*

No. 1.

Pyrogallic Acid ...	... 1 ounce	50 grammes
Sodium Sulphite (cryst.)	... 2 ounces	100 ,,
Citric Acid	... 40 grains	4·5 ,,
Water to	... 10 ounces	500 c.c.

No. 2.

Sodium Carbonate (cryst.)	... 8 ounces	100 grammes
Sodium Sulphite (cryst.)	... 8 ,,	100 ,,
Water to	... 80 ,,	1 litre

Take 1 dram (4 c.c.) of No. 1, 1 ounce (30 c.c.) of No. 2, 5 minims (or drops) of a 10% solution of Potassium Bromide, and dilute with water to make 10 ounces (300 c.c.) in all.

The time of development at 65° Fahr. is 20 minutes.

If preferred the metol-hydrokinone formula given on page 33 may be used, each ounce of the solution being diluted with ten ounces of water. At 65° Fahr. the time of development will be fifteen minutes.

FIXING.

If the films have been developed in a tank, the instructions for fixing issued with the apparatus should be carefully followed. Films which have been developed in the length by hand, should be passed several times through a dish of water before fixing. It will be found convenient at this stage to cut the film up (rounding the corners as mentioned above), and transferring the separate negatives to the fixing bath.

FIXING BATH.*

Hypo	4 ounces	100 grammes
Water	20 ,,	500 c.c.

On no account must the films be allowed to lie motionless, one on top of another, while in the hypo. They must either be laid out separately or must be kept moving, taking the one at the bottom and placing it at the top and so on. The fixing should be carried on until the whole of the white appearance at the back of the film has disappeared and for *as long again.* Complete fixing is as important as thorough washing.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

WASHING.

When fixing is complete the films should be transferred to the washing water. If the film has not been cut up the two ends should be clipped to opposite sides of a large dish, and the water allowed to flow gently in at one corner, tilting the dish slightly towards the opposite corner so as to ensure a steady current of water throughout the whole length of the film. Films which have been cut up may be washed by transferring them to a dish of clean water, constantly changing the water, draining the films and rinsing the dish between each change. If this is done a dozen times, allowing about half an hour for the operation, the films will be thoroughly washed, provided they have not been allowed to lie on top of one another. If this has been the case, the washing will take much longer, and at least one hour should be allowed. There are various other effective methods of washing films. They may have the centre of one edge inserted in a cork and so be floated vertically in a large vessel of water ; an ordinary bath answers very well, but they should receive two or three rinsings before being washed in this way, to get rid of the greater part of the hypo. Another plan is to pin the film, after one or two rinses, face outwards on a board, curving the film slightly so that the water may get to the back as well as to the front. The board is floated face downwards on the surface of a large vessel of water such as a bath. The water should be changed three or four times.

When the washing is finished the films must be pinned up by one corner to dry. No alum bath or glycerine bath is necessary. The films will dry quite flat of themselves. As WELLINGTON Film is NON-CURLING, both sides are coated, and therefore neither side must be in contact with anything during the process of drying. The simplest way is to pin them up to the edge of a shelf, putting the pin firmly into the shelf and sliding the film out to its head.

GENERAL HINTS.

WELLINGTON Film is richly coated and has great latitude. For this reason over-exposure is much less likely to be harmful than under-exposure.

WELLINGTON Film will be found to have splendid keeping properties, but all films should be kept in a cool, dry place. A room in which there is usually a fire is not a good place for keeping sensitive materials.

All solutions applied either to plates or films should be as near one temperature as possible. In summer time they should be as cold as possible, but in the depth of winter it is well to bring them to the temperature of an ordinary living room, say, 60° Fahr., before using. An ice-cold developer or fixer is very slow in action, and the former may lead the user to suppose his films are under-exposed, when the exposure all the time has been correct.

Which is the Best Paper to Use?

THIS is a difficult question, but one that is often asked. The answer depends entirely on the requirements of the worker, and upon the type of negative from which he desires to print.

The notes which follow are intended to show the conditions under which each of the WELLINGTON papers becomes most useful.

For winter work when the light is bad, or for photographers who cannot do their printing in the day-time, those papers which can be printed by an exposure of a few seconds to artificial light offer advantages over all others.

There was a time when such papers were incapable of yielding results equal in quality to those obtainable on " print-out " papers, but that day has long passed, and at least nine-tenths of the very best photographs produced at the present time are made on " development " papers, of which the WELLINGTON BROMIDE, the WELLINGTON S.C.P. and the WELLINGTON B.B. Papers are good examples.

The WELLINGTON Bromide Papers are coated with an emulsion very similar to that of a slow dry plate, and therefore require a dark-room for their manipulation. They are the best

papers that can be used for the making of enlargements by artificial light, as their speed is such that the exposure is never unduly long. For contact printing they are equally suitable, and the only drawback to their use—if indeed it is a drawback—is that they must be handled in a photographic dark-room.

The WELLINGTON BROMIDE Papers are manufactured in a wide variety of surfaces, particulars of which will be found on pages 40 and 41, and in two tints, White and Cream. The colour normally obtained in development is a pure black, but by after toning, as explained on pages 55 to 59, very beautiful sepia tones can be secured. For this purpose the Cream papers are best, although both White and Cream can be used with success.

For printing on Bromide paper by contact a normal negative is the most suitable. The shadows should not be unduly transparent, nor should the high-lights be over-dense.

WELLINGTON S.C.P. (Slow Contact Paper) differs from bromide paper in being from thirty to sixty times slower. The speed has been so adjusted as to allow of the paper being exposed at a few inches from an ordinary gas-jet or electric bulb, and developed in the same room at a distance of a few feet from the light, or in the shadow of a screen so placed as to intercept its direct rays. No dark-room is necessary with S.C.P. It is therefore a most convenient paper for the amateur, who will often find a warm sitting-room more pleasant than a cold dark-room in which to make his prints.

A list of the different grades of S.C.P. will be found on page 62. It will be noted that there are two distinct kinds, Vigorous and Soft. Vigorous S.C.P. is the slower and is intended for use with very thin negatives. With this grade it is possible to make excellent prints from negatives which would be almost unprintable on any other paper. Soft S.C.P. is twice the speed of the Vigorous grades and is intended for use with " normal " or vigorous negatives. The normal colour of an S.C.P. print is a fine cool black.

WELLINGTON B.B. Paper is a new paper, intermediate in speed between WELLINGTON Bromide and S.C.P., but differing from both in that it gives an image of a fine warm black. Prints on B.B. Paper possess an indefinable note of distinction which appeals strongly to artistic workers.

B.B. Paper is manipulated in much the same way as the WELLINGTON Bromide and requires a similar negative. A list of the various grades in which it is made will be found on page 71.

For daylight working WELLINGTON P.O.P. (a gelatino-chloride print-out paper) will be found excellent. The image prints out visibly under the action of light, and by gold toning any tone from red to warm black can be obtained. WELLINGTON P.O.P. is made in a variety of tints and surfaces, and is especially suited to toning in the Ammonium Sulphocyanide Bath. Thick P.O.P. manufactured in glossy, matt and carbon surfaces, is a charming paper for small work from snap-shot negatives, etc., as it does away entirely with the necessity of mounting, and, unmounted, stands a lot of handling. Carbon P.O.P. has that very fine semi-matt surface usually associated with a carbon print.

For those who prefer a print-out paper, but wish to avoid the trouble of toning, WELLINGTON SELF-TONING P.O.P. will be found highly suitable. This paper contains within itself the compounds necessary for toning, and requires only to be fixed in an ordinary hypo bath.

Mention must be made in conclusion of the many Thick or Double-weight grades of Bromide, S.C.P. and B.B. Paper. These papers give fine results when printed with a wide margin and left unmounted, a method of treatment which is not only cheap and simple, but often highly artistic.

This type of paper is very suitable for Christmas cards, ball programmes, menus, etc., and can also be obtained in the form of post-cards, printed on the back in the usual way.

Wellington Bromide Papers.

WELLINGTON BROMIDE PAPERS are manufactured in a great variety of surfaces and in six distinct kinds:—PLATINO-MATT, ORDINARY, CARBON, CHAMOIS, CREAM CRAYON and ENAMMO.

Some explanation is necessary to make clear the exact meaning of each of these designations.

The first bromide paper manufactured possessed a shiny surface—but by no means as glossy as the glossy bromides manufactured to-day. After a time a demand arose for a perfectly matt paper, similar in appearance to platinum paper, which had always been noted for its natural, non-glossy surface. To meet this demand manufacturers discovered a means of avoiding the shiny effect, which was until then characteristic of all bromide papers, and a paper was produced with a matt surface, which was called "PLATINO MATT" Bromide. To distinguish the older type of paper the latter was termed "ORDINARY." These designations are still used, although the papers themselves have undergone many changes for the better.

PLATINO-MATT BROMIDE PAPERS are manufactured with a matt surface entirely free from sheen. They are supplied in the following grades:—Special Smooth, Smooth,

Rough and 'Xtra Rough, and in Thick Special Smooth, Thick Smooth and Thick Rough.

ORDINARY BROMIDE PAPERS possess a surface with a very slight sheen. They are made in the following grades :— Smooth, Rough and Thick Smooth.

CARBON BROMIDE is a paper with a rich Semi-Matt surface resembling a carbon print in general effect. It is made in two grades, Thin and Thick.

CHAMOIS is the title applied to certain grades of the WELLINGTON Bromide Papers which have been manufactured with a peculiarly delicate surface suggestive of that possessed by chamois leather. This paper, which is largely used by professional photographers for " sketch " work, will take the pencil or brush without special preparation. It is made in four grades, Hard White and Hard Cream for soft and normal negatives, and Soft White and Soft Cream for vigorous negatives.

CREAM CRAYON is the title applied to a series of WELLINGTON Bromide Papers manufactured on a cream tinted base. These are particularly suitable for sepia toning, and are made in Smooth, Rough and 'Xtra Rough Surfaces.

ENAMMO is the name of those grades of WELLINGTON Bromide which possess a highly glazed surface. These are made in Thin and Thick grades, and also in a special grade known as Press Enammo, which is largely used in press work owing to the readiness with which it gives bright prints from weak negatives.

A special feature of the WELLINGTON Enammo is its freedom from stress marks.

Enammo Bromide is strongly recommended for making prints from X-ray negatives.

The average speed of the WELLINGTON Bromide Papers is H. & D. 30.

Wellington Bromide Papers

GENERAL REMARKS.

THE following instructions apply to all grades of WELLINGTON Bromide and should be carefully read before any work is attempted.

All bromide paper is extremely sensitive to light ; the packets, therefore, must be opened and all work carried out in the *dark-room.* In this respect Bromide paper resembles plates, but it possesses the advantage that a great deal more light can be used during manipulation. With bromide paper it is possible to employ yellow light and plenty of it. If gas or lamplight is used, then two thicknesses of yellow glass or fabric will render it perfectly safe, while for daylight three thicknesses are all-sufficient. Such a light allows everything in the dark-room to be seen with comfort after a few minutes, and is far less trying to the eyes than the dim ruby light so frequently used.

A packet of Bromide Paper being taken into the dark-room and opened, will be found to contain a number of sheets of paper rather stiffer than might be expected when their thickness is taken into consideration. They also have a very slight tendency to curl. This is not enough to cause inconvenience, but is useful as indicating the sensitive side. The stiffness is due to the fact that the paper is coated on one side with a gelatine emulsion containing Silver

Bromide, and the curling always takes place with the coated side *inside*—in other words, the concave side or surface of a piece of Bromide paper is the sensitive side ; the convex is the back. Printing on such material is very rapid. Owing to its sensitiveness, care must be taken not to expose the paper more than is necessary, even to the light in the dark-room.

There are two ways of printing upon Bromide paper, namely, by contact and by enlargement. Contact printing is the method adopted when the prints are to be the same size as the negative itself ; enlarging, when larger prints are required.

CONTACT PRINTING.

The following are the stages of making a Bromide print by contact :—

Filling the Printing Frame. (Done in the dark-room).
Exposing to artificial light.
Developing the print. (Done in the dark-room).
Fixing the Print. (Done in the dark-room).
Washing the Print.
Drying and Mounting the Print.

FILLING THE PRINTING FRAME.

Any printing frame can be used for Bromide work. It does not matter whether it will open at the back or not for inspection of the print, because with Bromide Paper this inspection cannot be made. With small negatives the ordinary printing frames are quite suitable.

Only one of the needful size is wanted, as the exposure is very short, and it is not advisable to try to expose more than one print at a time.

The frame is taken into the dark-room, the negative put into it and dusted, and then, in the yellow light only, the packet of Bromide paper is opened, and a sheet taken out and laid with its sensitive side in contact with the gelatine side of the negative. The back of the printing frame is put in and fastened, and the rest of the paper is wrapped up safely again. In handling Bromide

paper, care must be taken not to touch the sensitive surface with moist or dirty fingers, or it will most certainly be marked. If the paper is not of the required size, it should be cut with a pair of scissors, and not folded and torn, as this also may lead to marks upon it.

EXPOSURE.

The rapidity of Bromide paper is such that artificial light answers excellently for printing purposes; it is therefore a good method of working in the evenings or in the winter, when it is often almost impossible to get prints in any other way.

Exposure as far as possible should always be made to the same light. If a paraffin lamp is used, then it should always be employed at its best, *i.e.*, with the wicks carefully trimmed and turned up as high as possible without smoking. If a gas jet is the light preferred, then it must in the same way be turned up as high as it will go without roaring. If the pressure is poor, the loss of light should be allowed for when exposing; and in this connection, it is well to remember that in towns the pressure is generally at its worst on Sunday evenings.

By attention to these points it is possible, and indeed quite easy, having once found what exposure a negative requires, to make as many prints as may be wanted, either all at one time or at intervals of months apart *without wasting a single piece of paper through under or over-printing.*

The printing frame is then placed at a definite distance from the light and the exposure made. The best distance for the frame is 18 inches from the light, and this distance should be measured—not guessed—and adhered to. It is easy to make a mark on the table or wall at 18 inches from the source of light, or to tie a piece of string to the burner with a knot at 18 inches from the flame. With an average negative, the following list of exposures with various illuminants may be taken as an approximate guide.

EXPOSURES AT A DISTANCE OF EIGHTEEN INCHES.

To an ordinary (" batswing ") gas burner	6 seconds.
To a duplex paraffin lamp with clear glass chimney	5 ,,
To an incandescent gas burner in good order ...	2 ,,
To a sixteen c.p. incandescent electric light ...	3 ,,
To a small acetylene burner	2 ,,

As the term " average negative " is of a very loose description, one or two trials will have to be made. For this purpose a sheet of paper may be cut into three or four pieces, different exposures given to each and marked on them in pencil, and then all developed together. One such experiment should be quite sufficient to give the beginner at Bromide printing a perfectly clear idea as to the exposure required.

The advantage of always working with the same light, and at the same distance from it, is this : when once the exposure has been found, the number of seconds may be written upon one corner of the negative in pencil, and when another print is wanted it can be made straight away, with the certainty that the exposure is correct. There is no real difficulty in determining the exposure any negative will want without this guide, but it is convenient to have it, and it costs no trouble.

DEVELOPING THE PRINT.

This, of course, must be done in the dark-room. The exposed paper is taken from the printing frame, or, if an enlargement, from the enlarging apparatus—both contact prints and enlargements are from this stage onwards treated in the same way—and laid face upwards in a clean dish.

If the prints are small ones, say, up to and including 10×8 inches, the developer may be poured straight on without first wetting the paper in water. For larger sizes it is better to allow the print to soak for a minute in clean water, to pour this off and drain for a moment, and then to flow over the developer. While in the water the print should be examined to see that it is wetted

all over, and that there are no air bubbles clinging to its surface. This preliminary wetting is intended to prevent air bubbles, which, if occurring during development, would produce an innumerable number of small white spots. With large sizes it is a good plan to rub the surface gently with a tuft of cotton wool as soon as the developer is applied, but with small prints it is better to see that they are evenly covered with developer, and not to meddle further with them.

When a little experience has been gained the worker will find it better to immerse his prints direct in the developer, instead of pouring the developer over them. The operation is not at all difficult and as the developer is not poured to and from the measure for each print, oxidation takes place less rapidly and the solution can be used for a greater number of prints than would otherwise be possible. A sufficient quantity of solution should be poured into the dish and the print simply slid under the surface of the liquid. While doing so the dish should be tilted, and when the print is immersed, tilted back again so as to send a wave of solution over the paper.

During development the dish must be rocked gently, so as to keep the liquid moving over the surface of the print. If the exposure has been correct, the image will make its appearance in a few seconds, the actual time depending upon the strength of the developer and its temperature. Over-exposure causes the image to appear very quickly ; with under-exposure the picture is very slow in appearing, and will lack strength. In these respects Bromide paper resembles the ordinary plate used for making negatives, and anyone who has developed a few negatives will have no difficulty, when taking up Bromide printing, in recognising at a glance under or over-exposure.

The same developer may be used for six or more prints in succession, but it should be thrown away when it becomes slow in action and a fresh lot taken, otherwise the tone of the prints will not be good.

No attempt must be made in developing prints to correct errors in exposure. The solution must be poured on as aforementioned, and if the exposure is wrong, then another print must be made. If the exposure is right, development will be complete in about two minutes. With good negatives and *correct exposure* there is little likelihood of over-development, as at the right stage the action of the developer seems to stop almost entirely. This is especially the case with amidol. This stoppage of development may be taken as an indication that the process is finished, but should not be relied on to the extent of leaving the print in the developer too long, or the whites of the picture will be degraded.

When the print is judged to be fully developed it may be placed straight in the fixing bath without washing, although there is no objection to a preliminary rinse of a few seconds.

It is well to mention here that a bromide print always looks brighter and richer after fixation than it does when it leaves the developer. The finished print, however, will appear darker in the subdued light of the dark-room than in daylight. The beginner should, therefore, fix his test prints and examine them in ordinary light, bearing in mind that a slight darkening will always be noticeable on drying. The print when wet should appear just a shade too light.

DEVELOPERS.

Many developers are suitable for Bromide papers, and each has its adherents. We recommend metol-hydrokinone or amidol, but any developer suitable for Bromide work may be employed successfully with the WELLINGTON Papers.

AMIDOL (DIAMIDOPHENOL) DEVELOPER.*

Sodium Sulphite (cryst.)	650 grains	40 grammes
Amidol (Diamidophenol)	50 ,,	3 ,,
Potassium Bromide	10 ,,	0·75 ,,
Water to	20 ounces	500 c.c.

The sodium sulphite must be dissolved first.

It is often recommended to keep a stock solution of sodium sulphite by itself, and to take some of this when wanted and add the amidol. *Long experience shows that this will not do*, as amidol

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

when used with stale sulphite solution develops very slowly, and there is a great loss of brilliancy in the resulting prints—a result for which the manufacturer often gets the blame. The developer given above should therefore be prepared as directed and used within three days of mixing.

A single-solution developer which keeps very well is the following :—

METOL-HYDROKINONE DEVELOPER.*

Metol	20 grains	1 gramme
Hydrokinone	60 ,,	3 grammes
Sodium Sulphite (cryst.) ...	700 ,,	35 ,,
Sodium Carbonate (cryst.) ...	700 ,,	35 ,,
Potassium Bromide	6 ,,	0·3 gramme
Water to	20 ounces	500 c.c.

First dissolve the metol in water, then the other ingredients in the order named. For use dilute with an equal volume of water.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

The Borax M.Q. formula given on page 15 will also be found very suitable for use with the WELLINGTON Bromides. It gives rather less contrast than the formulæ mentioned above.

It should be remembered that with any developer the print becomes flatter and more of a brownish or greenish colour the more bromide there is present in the solution. A weak developer with a full exposure yields a soft and grey result. Vigorous images with good, rich blacks can only be obtained by giving a short, but sufficient exposure, and developing with a strong, but slightly-restrained developer, such as those given above.

It is not a good plan to place the prints in water after developing and before fixing them, as the developer goes on acting to a certain extent, and prints so treated will be found to be less brilliant and to have a slight greyish veil in the lighter parts, which should not be present.

FIXING AND WASHING BROMIDE PRINTS.

The fixing bath recommended is made up as follows :—

Hypo	4 ounces	100 grammes
Water to	20 ,,	500 c.c.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

If preferred, the following acid hypo bath may be employed :—

ACID FIXING BATH.*

Hypo	... 4 ounces	100 grammes
Potassium Metabisulphite	... 200 grains	13 ,,
Water to	... 20 ounces	500 c.c.

There are other methods of making up an acid fixing bath, but none are more simple or more effective than the above. The water may be warmed to make solution take place more quickly, but it must not be hot, or the potassium metabisulphite will have its power greatly reduced. The bath must, of course, not be employed until quite cold. This hypo bath does not discolour as is the case with a plain hypo solution ; it should, however, not be kept from day to day. Proper fixing is essential, both for the purity of the prints and to ensure their permanence.

In either of the above baths fixation will be complete in about ten minutes, provided the prints are not allowed to cling together. At intervals, and especially during the first few moments after immersion, they should be moved about, or the dish should be rocked.

In cases where many prints are being made it is an excellent plan to use two fixing baths, giving the prints an immersion of five minutes in each. When the first bath begins to show signs of discoloration or exhaustion it should be discarded and the second bath should take its place, a fresh bath being used for the final period of fixation.

There is rarely any need to use a hardening bath with the WELLINGTON Bromides. If blistering or softening of the film occurs the cause should be looked for in the manipulation. It should be made a rule to use all the solutions at approximately the same temperature, and never above 65° Fahr. Great difference in temperature between the various solutions, or between the solutions and the washing water, will sometimes—though by no means always—cause blisters to appear. The fact that this rule may often be transgressed with impunity does not excuse carelessness.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

It is well to remember in this connection that when hypo is dissolved in water a great fall takes place in the temperature of the solution ; indeed in winter crystals of ice may sometimes be seen to form on the outside of the containing vessel. If therefore hypo has to be prepared for immediate use, warm water should be employed, the dissolution of the hypo being sufficient to cool the solution. A better plan is to prepare the hypo well in advance. Any quantity may be so prepared, as the solution keeps indefinitely.

The strength of the hypo solution should never exceed that given on page 48. A strong solution is less efficient than one of proper strength, and blistering is liable to follow its use.

During washing a stream of water should on no account be allowed to fall violently on the prints, otherwise the film may be bruised and blisters will result. A gently flowing stream is equally effective and much safer.

In hot climates, and even in temperate climates where the water supply is exceptionally soft, the use of a hardening bath may be found necessary. The following is a satisfactory formula :—

HARDENING BATH.

Alum	1 ounce	25 grammes
Water to	20 ounces	500 c.c.

The prints should be well rinsed after fixing, and then placed in the above solution for ten minutes, after which they should again be washed.

Most workers will prefer a combined fixing and hardening bath, and provided this is properly prepared and not used for an undue number of prints there is no objection to its employment. The formula which follows is recommended :—

COMBINED FIXING AND HARDENING BATH.

Hypo	4 ounces	200 grammes
Potassium Metabisulphite ...	60 grains	6·5 ,,
Chrome Alum	240 ,,	25 ,,
Water to	20 ounces	1 litre

The hypo and metabisulphite should be dissolved in one half of the water and the alum in the other. The two solutions should then be mixed.

This bath fixes the print, and at the same time toughens the film to such a degree that it can be washed in warm water, and if necessary dried by heat.

The following points should receive attention :—

The same dish should not be used for developing and fixing.

On no account should hypo be allowed to contaminate the developer.

If the hypo solution is splashed on to the Bromide paper, or transferred from the clothes of the worker, at any stage before fixation, stains will result.

The print must not be exposed to any light except that of the dark-room until fixation is complete.

To ensure complete fixation, the prints should be immersed face downwards ; they should on no account be allowed to float on the hypo bath, otherwise discoloration is liable to occur.

A fixed print which is allowed to float film upwards on the hypo bath for a considerable period will begin to bleach, and in time the image will almost entirely disappear.

After the prints are fixed they must be washed. Many people pay little attention to the sufficient fixing of the prints, and devote a great deal of time to washing them. The reverse is better, although neither process should be neglected. Prolonged washing is a mistake ; what is required is to eliminate the hypo as quickly as possible. For this there is nothing like running water, and many washers are made in which prints can be washed without requiring much attention. If the washing is to be done in a dish, then what has been said about fixing applies with equal force to washing. The prints must not be allowed to overlap unless they are kept in continual motion. Consequently for small prints, if there are many of them, a big basin will be found more suitable than the flat photographic dish.

A washer, which works admirably, can be extemporised out of any big basin and a piece of thin muslin or net. The prints are placed in the basin, which is stood on the middle of the muslin in the sink. The muslin is then drawn up all round till it fits the edge of the basin and is tied over the mouth of the tap. A little arrangement will show how a small stream from the tap should fall so as to give a constant circulation to the water, and thus keep the prints separate and moving. The muslin allows the water to flow away, but prevents the prints from washing out of the vessel.

Washing performed in basins or dishes in which the overflow is from the top must be done with the water constantly in motion, otherwise the hypo solution sinks to the bottom and does not flow away. If the water flows out of a hole or syphon at the bottom of the vessel, as in most of the ready-made washers, so much motion need not be given to the water, because the hypo solution passes away more easily. Whichever plan is adopted washing will be finished in 30 minutes, provided the water has been running all the time, or, in the case of hand washing, has been constantly changed, the prints being drained and the dish rinsed between each change.

DRYING, TRIMMING AND MOUNTING BROMIDE PRINTS.

When the washing is finished, the prints must be taken out one at a time and then dried. The simplest way of drying, if a few small ones only have to be dealt with, is to mop off the superfluous moisture from back and front with good photographic blotting-paper or a clean cloth, and then to lay them face upwards on a clean sheet of paper where they can dry out of the dust. Prints must not be allowed to dry between blotting-paper, or, owing to their surface being composed of gelatine, they will stick to the paper.

Large prints are most conveniently dried either by putting them over a line or hanging them from one corner by means of clips. A number of small prints can be dealt with by running a pin through one corner of each and sticking it into the edge of a shelf, or a piece of wood supported at its ends, so that the prints

hang with each side exposed to the air. In a warm room they dry more quickly in this way than in any other.

Prints must be dried in a room free from dust or fluff, as if this adheres to the surface spoilt prints will be the result. No attempt should be made to dry prints by *heat*, unless they have been previously hardened.

Bromide prints are trimmed after drying. This operation can be performed in the usual way with a sharp knife and a glass cutting shape, or, in the case of large prints, with a steel straight-edge. Any of the ordinary forms of print-trimmer can be used, and the process calls for no special remarks.

Bromide prints are best mounted by the dry mounting process, but the outfit needed is expensive and beyond the reach of most amateur workers. The notes which follow are intended for those who have to mount in the ordinary way.

The following gelatine mountant is strongly recommended. It keeps excellently, and will be found a better and stronger adhesive than starch.

An ounce of Nelson's No. 2 Gelatine is allowed to swell in 12 ounces of cold water for half-an-hour, and is then dissolved by the aid of heat. When it is quite melted, 5 ounces of methylated spirit are added with constant stirring, and 15 grains of carbolic acid or of some other suitable preservative. This mountant requires melting by standing the bottle in hot water before use, and will bear melting and remelting over and over again without injury to its adhesive properties. The equivalents of the above quantities in the metric system are—Gelatine 30 grammes, water 360 c.c., methylated spirit 150 c.c., carbolic acid 1 gramme.

The dry trimmed prints require to be soaked in water and blotted off before being mounted. One must have at hand a pile of clean pieces of paper, and the first print, when blotted off, is laid face downwards on the pile. Using a stiffish brush, its back is brushed over with some of the mountant, care being taken not to apply too much. It is then placed quickly in position on the mount, a clean piece of blotting-paper is placed in contact, and

it is then rolled over with a roller squeegee in order to ensure contact and to expel any air bubbles. The rolling must not be done violently, but just enough pressure exercised to get the print down smoothly. The blotting paper is then removed and the mounted print is put on one side to dry.

With thick Bromide papers a very nice effect can be obtained by dispensing altogether with a mount, and masking the negative so as to give a print with a white margin. If unmounted prints are wanted perfectly flat, they can be made so by putting them aside under pressure for a day or two. When only a few are to be flattened, a very good way is to put a piece of stout glass in a printing frame, insert the prints, fasten the back, and leave them like this until they are wanted. They will come out quite smooth and flat. Prints may be vignetted on to one corner of a piece of paper and the rest printed for the purpose of a menu, a Christmas card or a post-card. In fact, there are numerous ways in which thick papers may be employed, many of which will no doubt suggest themselves to the reader.

A particularly effective method of finishing Bromide prints is to frame them in the passe-partout style. A piece of glass and a stout strawboard are cut to the size of the picture. The latter is then placed between the glass (which should previously have been thoroughly cleaned) and the strawboard backing, and the whole tightly bound together with narrow strips of gummed paper in the same way as a lantern slide. If the picture has been multiple mounted a gummed paper edging may be selected to harmonize with the tints of the mounting papers.

Rings for hanging may be fastened to the strawboard backing by means of tape-loops passed through slots in the strawboard and the ends glued before binding up.

GLOSSY SURFACE BROMIDE PRINTS.

If a highly-glazed surface is required the " Enammo " paper must be used. The gloss on this can be increased by drying the prints on glass or ferrotype in the following manner.

A waxing solution is prepared by dissolving 60 grains of bees-wax cut up into shreds in 10 ounces of benzol (4 grammes in 300 c.c.). This should be shaken at intervals for a day or so, and then the clear solution of wax poured off into a well-corked bottle for use.

The clean glass or ferrotype plates should be rubbed over with a little of this solution on a rag or tuft of cotton-wool, and then polished with a clean cloth. When glass plates are used French chalk (talc) may be substituted for the glazing solution mentioned above. The talc is dusted over the well-cleaned glass, rubbed in with a piece of cotton wool and the surplus powder lightly polished off. The wet prints are then laid on the plate face downwards, squeegeed into contact, and allowed to get thoroughly dry before being removed.

On no account must any attempt be made to dry by excessive heat, or a peculiar mottling will result, and it may be difficult to remove the print from the ferrotype. While there should be no difficulty about stripping the prints, some workers experience trouble in this respect. This can be prevented entirely by first drying the prints, and then rewetting and squeegeeing as previously described.

It should be remembered that the above process is necessary only when a very high glaze is required. The normal surface of the paper is quite glossy enough for all ordinary purposes.

WELLINGTON Enammo is entirely free from stress marks.

TONING BROMIDE PRINTS.

Prints on WELLINGTON Bromide paper will yield particularly fine colours if toned as described below.

If the " Sulphide " or the " Hot Hypo and Alum " bath is used the toned image may be regarded as equal in permanence to that obtained by any photographic process.

The Cream Crayon and Cream Chamois grades are perhaps the most suitable, as the cream tint of the paper harmonizes particularly well with the sepia image. The effect obtained with these papers is exceedingly mellow and artistic, but any of the other grades may be used with success, and are indeed preferred by some workers.

THE SULPHIDE PROCESS.

Prints for toning by the Sulphide process should be correctly exposed and allowed to remain in the developer until the action of the solution is seen to stop, which, with the formulæ previously given, will occur in about two minutes. Prints which have been over-exposed and then developed for a brief period will often appear fairly satisfactory in the black and white stage, but will give an unpleasant yellow tone in the sulphide bath.

Fixing and washing must be thorough. Imperfect fixing will result in the appearance of dark stains after immersion in the sulphide bath, and imperfect washing will give rise to patches which refuse to darken in the sulphide, but remain a pale yellow colour.

The following stock solutions are required for toning.*

No. 1.

Potassium Ferricyanide	... 400 grains	45 grammes
Potassium Bromide ...	... 600 ,,	65 ,,
Water to	... 10 ounces	500 c.c.

This solution keeps almost indefinitely if protected from the action of light.

No. 2.

Sodium Sulphide (pure)	... 1 ounce	30 grammes
Water to	... 10 ounces	300 c.c.

This solution will keep for a few months only.

To tone the print it is immersed in—

Stock solution of Ferricyanide and Bromide	1 ounce	50 c.c.
Water to	... 10 ounces	500 c.c.

In this the image will almost disappear in something under five minutes. The print should be left in the solution until there is no doubt that the action has gone as far as it will, and must then, after a wash of about five minutes, be immersed in

Stock solution of Sodium Sulphide	½ ounce	25 c.c.
Water to	... 10 ounces	500 c.c.

In this the print gradually re-develops to a fine sepia colour. It should be left until there is no doubt that the action of the solution is complete, after which it should be washed in several changes, or in running water for a quarter of an hour.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

It is interesting to note that prints which are bleached immediately on removal from the washing water are colder in colour than prints which have been dried between washing and bleaching.

If a warmer sepia tone is required than that which is obtained by bleaching and re-developing in the solutions given above, a small quantity of a 10 per cent. solution of potassium iodide may be added to the sulphide, say, one dram to each pint of the dilute solution.

The sulphide solution must on no account be stronger than that given above, or there will be a risk of the print blistering. With the strength given there is no chance of trouble from this cause.

The finished print, after toning, may be mounted on a stout card, and " encaustic paste," or a solution of wax in turpentine, well rubbed into the surface, afterwards wiping off as much as possible. This imparts great richness to the print, and is particularly suitable for enlargements which are to be framed up close. Pictures so made cannot be distinguished either in colour or quality from the best sepia carbon prints.

The following is a suitable formula for the Encaustic Paste :—

Purified Beeswax	500 grains
Oil of Lavender	300 ,,
Benzol	300 ,,
Gum elemi	10 ,,

If desired the sulphide-toned image may be re-toned to a rich red colour by immersion in the following bath :—*

Ammonium Sulphocyanide ...	100 grains	10 grammes
Gold Chloride	10 ,,	1 gramme
Water to	10 ounces	500 c.c.

After toning, wash for ten minutes in running water or several changes.

THE HOT HYPO AND ALUM TONING BATH

For Sepia tones the Hot Hypo and Alum Toning Bath can, if preferred, be used in place of the method described in the preceding pages. A stock solution is made by dissolving ten ounces of Hypo in seventy ounces of water heated to 135° Fahr., and when all is

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

in solution adding two ounces of Alum little by little. A whitish liquid results. This will keep indefinitely ; it should not be filtered, nor thrown away after use, as the older it is the better it works. In proportion as the volume is reduced by evaporation it should be replenished with new stock solution.

Before using a new bath, it should be " ripened " by immersing waste prints in the solution and raising the temperature to 140° Fahr., allowing the solution to cool, and then raising the temperature again to 140° Fahr., and again allowing it to cool. Or a small quantity of Nitrate of Silver (about 20 grains) previously dissolved in one ounce of distilled water and added to the stock toning solution may be employed as the " ripening " agent. If this " ripening " is omitted with a new bath the more delicate tones of the prints may become reduced.

To tone the prints, they are placed face downwards in an enamelled iron dish, and enough of the cold toning solution added to completely cover them. The dish is placed over a gas stove or spirit lamp, and the liquid gradually heated to 120° Fahr., and kept at that point until toning is complete. The prints are then taken out of the toning bath, rinsed in warm water, washed in cold water, and hung up to dry.

It is advisable to use a combined hardening and fixing bath for prints intended for toning in the Hot Hypo and Alum Bath, and if the prints appear slightly darker than would seem desirable, so much the better, as slight reduction takes place in toning.

TONING WITH COPPER AND IRON.

Very pleasant colours ranging from a warm black to a bright crimson can be obtained by what is known as Ferguson's process. Three stock solutions are required.*

A.	Neutral Potassium Citrate	4 ounces	100 grammes
	Water to	40 ,,	1 litre
B.	Potassium Ferricyanide ...	1 ounce	25 grammes
	Water in	10 ounces	250 c.c.
C.	Copper Sulphate	1 ounce	25 grammes
	Water to	10 ounces	250 c.c.

Before making up any formula, read the notes on pages **125, 126** *and* **134.**

Five ounces of A are taken and to this is added half-an-ounce of B and half-an-ounce of C (in metric measures, 100 c.c. of A, 10 c.c. of B and 10 c.c. of C). The print, after it has been fixed and well washed, is dried or not, whichever is more convenient. If dry it is soaked in water till it becomes limp. The wet print is then placed in the toning bath, and watched. It will be seen to commence to change colour at once, passing from black to warm black, brown, chocolate and finally red. When it reaches whatever colour is desired, it is taken out, washed for ten minutes in several changes of water and then dried.

Blue tones can be obtained by toning with iron. In this case besides the solution B mentioned above, the following will be required.*

D.	Ferric Ammonium Citrate	½ ounce	10 grammes
	Water to	10 ounces	200 c.c.

The actual toning solution is made by mixing.

B	1 ounce	30 c.c.
D	1 ounce	30 c.z.
Nitric Acid	½ dram	2 c.c.
Water to	10 ounces	100 c.c.

The prints are toned in this exactly as described above, and after toning may be washed for ten minutes or a quarter of an hour, and are then finished. In this process if the whites of the print are not clear by the time the washing is ordinarily finished, it may be continued until they are seen to be clear, always remembering that if the washing is too prolonged the print will be weakened.

There seems to be little doubt that these last two processes leave the print less permanent than if untoned or sulphur toned. It is well, therefore, if permanence is required, to stick to the untoned prints, or to sulphur toning. Still as these processes are often used, they are given here for what they are worth.

CLEARING AND REDUCING BROMIDE PRINTS.

It is sometimes necessary to clear or brighten a Bromide print. Surface markings or yellow stains due to some defect in the manipulation may be present, or slight fogging may have

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

occurred. In such cases the following bath will be found of great service. It should be applied after fixing and washing, the prints being immersed until the desired clearing has taken place, and then removed and well washed.

CLEARING SOLUTION.*

Thiocarbamide	20 grains	2 grammes
Citric Acid	10 ,,	1 gramme
Water to	10 ounces	400 c.c.

This bath will not work unless all traces of hypo have been removed from the print.

BRIGHT PRINTS FROM VERY WEAK NEGATIVES.

Every photographer at some time or another will find himself with a very thin, weak negative, which will not by any ordinary method give him a bright and vigorous print. The following method will be found to do so when every other means has failed.

A piece of Bromide paper is exposed in the usual way, and then developed for as long as there seems to be any increase whatever in depth, any discoloration of the high-lights being ignored. It must in fact be over-developed. After fixing and washing it is immersed in the following reducing solution until it is seen to be considerably lighter. It is then removed at once to clean hypo for a few minutes, and then washed and dried. If it is still not light enough the reduction may be repeated, until it is clear that any further action will make the deepest shadows grey instead of black. In this way a good print may often be obtained from a negative otherwise quite useless.

REDUCING BATH.*

Potassium Iodide	30 grains	2 grammes
Water to	10 ounces	300 c.c.
Iodine	3 grains	0·2 gramme

In this bath the whites of the print will assume a dark blue tint, owing to the formation of iodide of starch due to the sizing of the paper; this disappears immediately upon placing the print in the hypo solution.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

This reducing bath, if diluted, may be employed for clearing prints in place of the thiocarbamide solution given on the previous page. The prints after a short immersion should be transferred to hypo for five minutes and then washed.

LINE DRAWINGS IN PEN AND INK.

Bromide paper will be found very handy for this purpose. If we have a negative of some subject from which we wish to make a line drawing in pen and ink, we first make a Bromide print which, after fixing and washing, must be well hardened in an alum bath (made by dissolving an ounce of alum in a pint of hot water). It is then washed again and dried. This print is then gone over with a pen, using the indelible Indian ink, sold at most artists' material shops for the use of draughtsmen. The line drawing is made on the surface of the print with this ink, and then, when dry, the whole of the silver image is removed, either by the action of the reducer just described and hypo, or by the following bath, which will of itself entirely remove the image in from a quarter to half an hour, leaving the line drawing untouched.*

Thiocarbamide	... 120 grains	8 grammes
Nitric Acid	... 2 drams	8 c.c.
Water to	... 10 ounces	300 c.c.

ENLARGEMENTS ON BROMIDE PAPER.

The sensitiveness of Bromide paper makes it possible for enlargements to be made on it by artificial light or by daylight with great ease. This subject is dealt with separately on pages 76 to 89.

WELLINGTON BROMIDE POST-CARDS.

These are made in a variety of surfaces, and the manipulation is in every respect the same as has been already described. To enhance the attractiveness of the card it is only necessary to use masks which may be made by the worker himself, or can be purchased of photographic dealers. The post-cards are printed on the back in the usual form, so that there is no difficulty whatever in judging the sensitive side.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

Wellington S.C.P.

WELLINGTON S.C.P. (Slow Contact Paper) is manufactured in the following grades :—

For use with thin, flat or foggy negatives :—

VIGOROUS ART (Semi-Matt Surface), Thin and Thick.

VIGOROUS CARBON (Smooth Matt Surface), Thin and Thick.

VIGOROUS GLOSSY (Enamelled Surface), Thin and Thick.

For use with all other negatives :—

SOFT ART (Semi-Matt Surface), Thin and Thick.

SOFT CARBON (Smooth Matt Surface), Thin and Thick.

SOFT GLOSSY (Enamelled Surface), Thin and Thick.

The following grades are slightly less contrasty than the Vigorous grades, and may be used with soft or normal negatives :—

MATT, THICK MATT, GLOSSY,
THICK GLOSSY, CARBON (Semi-Matt) and
THICK CARBON (Semi-Matt).

S.C.P. is supplied in Post-card form in all grades.

S.C.P. is particularly noted for its keeping qualities, and its freedom from fog and stains.

Wellington S.C.P.

GENERAL REMARKS.

THE letters S.C.P., by which this paper is universally known, stand for "Slow Contact Paper." This title was applied because the paper is very much slower, or less sensitive, than ordinary Bromide paper, and therefore more especially suitable for making prints by contact.

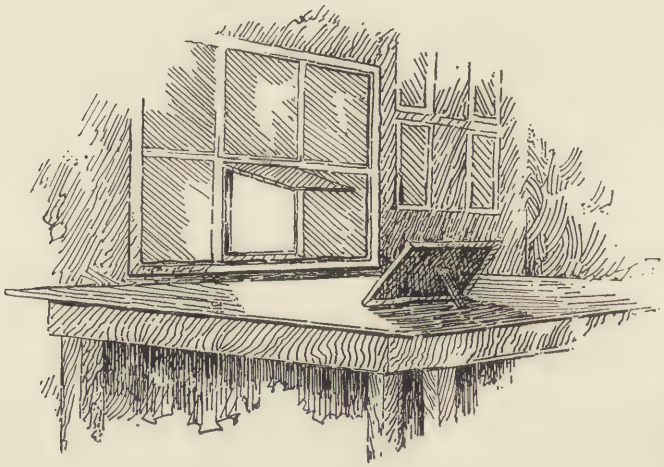
Compared with the WELLINGTON Bromide paper S.C.P. is correctly called slow, but it is still many times faster than P.O.P., and must therefore be handled much more carefully.

The great popularity of WELLINGTON S.C.P. may be traced to two qualities which it possesses *par excellence*, the beauty of the prints obtainable, and the ease and comfort under which they are made. While ordinary Bromide paper calls for a darkroom, and P.O.P. requires daylight, S.C.P. dispenses with both. All the operations can be performed in a room illuminated with ordinary artificial light, the speed of the paper having been so adjusted that while such light is sufficient to allow of the paper being printed at a distance of a few inches from the light, by retiring a few feet development may be carried out without any risk of fogging. As the light of the room is sufficient for printing purposes, common sense shows that if clean, bright prints are desired, the paper must not be unduly exposed during the other operations.

Little experience, however, is required to make clear how much light the paper can stand without risk. The best plan is to fill the printing frame and do the developing as near the light as is convenient, interposing a sheet of cardboard or some other opaque screen in order to intercept its direct rays. No other precaution whatever is necessary.

WELLINGTON S.C.P. can be printed by daylight, and provided the light is sufficiently subdued, can also be handled in daylight, but this latter is certainly not to be recommended, as there is great risk of light-fog resulting. The speed of printing is such that artificial light can be used very conveniently, and such light being quite uniform, there is little danger of making errors in exposure. Indeed, the latitude of exposure with WELLINGTON S.C.P. is so great that if artificial light is used for printing, there is no need for a single print to be spoilt.

If daylight is employed for printing, the room should have the window covered with yellow fabric (or " canary medium," as it is called), one thickness being sufficient. There should be a small space in the window, closed by an opaque shutter, which can be opened and shut quickly, as in the sketch below.



The shutter is closed while the packet of paper is opened and the printing frame filled. Then, after making sure that the packet has been wrapped up again, or slipped into a drawer or box, the printing frame is laid in front of the shutter in the window, and this is opened for the few seconds required to make the exposure, and is then again closed.

The exposure to daylight is extremely short, usually not more than a second or two. This is another reason for preferring artificial light, as very short exposures are sometimes a little difficult to manage. Daylight moreover changes from hour to hour, sometimes from minute to minute, so that it is not easy to secure uniformity. With artificial light any number of exposures all exactly alike can be given without difficulty.

As will have been gathered from the preceding remarks, S.C.P. is a development paper, the effect of the light not being visible at once. Many developers can be employed, but those which are given later have been carefully worked out to suit the paper, and experience has shown that they are the best. While very fine tones can be obtained with amidol, the metol-hydrokinone formula will be preferred by many, because the solution, if put up in well-stoppered bottles, will keep in good order for a long time.

The behaviour of S.C.P. in the developer is different in some respects from that of ordinary Bromide paper. With S.C.P. the image appears almost the moment the solution is poured on, development is complete in from fifteen to thirty seconds, and the print, as soon as it is seen to be sufficiently vigorous, must be transferred to the hypo.

With amidol there is no need to rinse the print between developing and fixing, unless it is desired to do so, but with metol-hydrokinone stains may appear unless such rinsing is given. The rinse should never exceed a few seconds.

The " Vigorous " grades are intended for use with thin, flat or foggy negatives, from which they allow of rich, brilliant prints being obtained. For negatives of normal contrast, or for vigorous negatives, the " Soft " grades are recommended.

S.C.P. POST-CARDS.

In addition to the ordinary S.C.P. the same coating is supplied on post-cards. These form, without exception, the simplest and easiest method of making photographic picture post-cards. They are worked in exactly the same way as the ordinary S.C.P., the only difference being in the thickness.

EXPOSING S.C.P.

Little need be said about this operation. The paper may be handled and the printing frame filled in diffused artificial light. There is no difficulty in recognising the sensitive side. In Glossy S.C.P. it is, of course, the shiny side ; in the matt varieties it is smoother and whiter than the plain paper at the back, and in all cases S.C.P. has a slight tendency to curl, always with the coated surface inwards. It is best always to expose at one distance from the light, as it is then possible to decide instantly upon the correct exposure by a mere glance at the negative. A very good plan to ensure the distance being the same is to fasten to one edge of the printing frame by means of a screw, a piece of wood which will project straight out in front of the frame. This wood is cut to a suitable length, and then, whenever a print is being made, the frame is fixed so that the wood just touches some given part of the gas bracket or lamp. Six inches will be found a very convenient distance for quarter-plate or smaller negatives, but for larger sizes it is better to use the frame further off so as to secure even illumination. The distance between the frame and the light should not be less than the diameter of the negative. With a normal negative and a 32-c.p. electric light, at a distance of six inches, the exposure will be approximately 30 seconds. With incandescent gas the time will be rather longer, and with a paraffin lamp two minutes may be necessary. The " Soft " grades of S.C.P. will require approximately one-half these exposures.

If the presence of a little magnesium smoke in the room does not matter, a piece of magnesium ribbon burnt at a distance of twelve inches from the printing frame is an excellent method of printing. The frame may be stood up at one end of a piece of wood twelve inches long, and at the other may be put a spirit lamp

at which to light the magnesium. At this distance a piece of magnesium ribbon half an inch long will be found about right for an average negative. The exposures should be varied by altering the length of ribbon burnt, not by varying the distance from the flame. A pair of pliers, or two coins, make a convenient holder for the ribbon, and a piece of card or blue glass should be held before the eyes while the ribbon is burning, or it will not be easy to see to develop immediately afterwards.

If printing is to be done by daylight, then, in a moderate light from one to three seconds will probably be found correct.

S.C.P. can also be used for enlarging, both by daylight and by artificial light, full instructions for which will be found in the chapter on enlarging on pages 76 to 89.

DEVELOPING S.C.P.

The following are the formulæ which will be found most suitable for developing S.C.P.

METOL-HYDROKINONE DEVELOPER.*

Metol	... 20 grains	1 gramme
Hydrokinone	... 60 ,,	3 grammes
Sodium Sulphite (cryst.)	... 700 ,,	35 ,,
Sodium Carbonate (cryst.)	... 700 ,,	35 ,,
Potassium Bromide ...	... 6 ,,	0·3 gramme
Water to	... 20 ounces	500 c.c.

The ingredients set forth should be mixed in the order named, each one being completely dissolved before adding the next.

This developer keeps almost indefinitely in well-stoppered bottles.

For the " Soft " grades of S.C.P. this developer should be diluted with an equal quantity of water.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power, and at very low temperatures becomes practically inert.

AMIDOL (DIAMIDOPHENOL) DEVELOPER.*

Sodium Sulphite (cryst.)	...1000 grains	50 grammes
Amidol (Diamidophenol)	... 100 ,,	5 ,,
Potassium Bromide ...	... 4 ,,	0·2 ,,
Water to	... 20 ounces	500 c.c.

The ingredients should be mixed in the order named, the sulphite being dissolved before the amidol is added.

This developer, which gives brilliant cool black tones, will keep good for three days only. After that time it should be discarded and fresh made up.

For the " Soft " grades of S.C.P. this developer should be diluted with an equal quantity of water.

** Before making up any formula, read the notes on pages* 125, 126 *and* 134.

Whichever developer is selected, the print, supposing it to be not larger than half-plate, should be laid, face upwards, in a clean dish, and the developer poured quickly and evenly over its surface. The image will appear almost instantly, and should be watched until it is seen to be about the right depth, when the print is taken out and placed in the hypo solution. As previously mentioned, a rinse of a second or two is necessary before fixing if metol-hydrokinone is used, but with amidol the prints may, if desired, be placed direct in the hypo. Prolonged washing between developing and fixing brings about discoloration. If the prints obtained with the metol-hydrokinone developer are brighter than is desired, it will be found possible to increase the exposure slightly, and to use the developer diluted with its own bulk of water. The amidol developer is best not diluted except when used with the soft grades. Either developer may be used over and over again, but as soon as it is seen that the colour of the prints is not what it should be, the developer should be discarded and fresh employed.

Prints larger than half-plate are not easily covered with the developer in one quick sweep, and it will probably be found more convenient to allow them to soak in clean cold water for a few seconds, pouring off and draining away as soon as the print is limp, and then developing.

WELLINGTON BORAX-M.Q. DEVELOPER.

The following Borax-M.Q. developer (also referred to on page 15) can be used with success for the development of S.C.P.

Metol	... 20 grains	1 gramme
Hydrokinone	... 50 ,,	2·5 grammes
Sodium Sulphite (cryst.)	... 200 ,,	10 ,,
Borax (powdered) ...	... 200 ,,	10 ,,
Water (hot)	... 20 ounces	500 c.c.

Dissolve in the order given, allowing each chemical to be in complete solution before adding the next. This developer keeps almost indefinitely in well-stoppered bottles.

N.B.—All metol-hydrokinone developers should be used at a temperature between 60° and 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

To prevent fog it is necessary to add 1 drop of a 10% solution of potassium bromide to each ounce of developer. The image will be of a black tone with a slight tendency to warmth, and softer in gradation than that given by the amidol and metol-hydrokinone formulæ previously mentioned.

By increasing the potassium bromide to 10 drops of a 10% solution per ounce, decidedly warm tones can be obtained. Development will take from three to four minutes.

Fixing.

In the following fixing bath S.C.P. is completely fixed in five minutes.

Hypo	4 ounces	100 grammes
Water to	20 „	500 c.c.

If an acid fixing bath is preferred, the following may be employed :

Hypo	4 ounces	100 grammes
Potassium Metabisulphite ...	200 grains	13 „
Water to	20 ounces	500 c.c.

If a combined hardening and fixing bath is preferred the formula given on page 50 will be found suitable.

The prints should be submerged in the hypo during the whole period of fixation, and not allowed to float on the top, otherwise stains may result. Nor must it be expected that they will fix properly if allowed to lie together in a mass. They must either lie separately, or be kept moving.

WASHING, DRYING AND MOUNTING S.C.P.

On taking the prints from the hypo bath, they must be thorough washed. There is no need to repeat here what has already been said with reference to the washing of bromide prints, as it applies with equal force to S.C.P. The reader is therefore referred to page 51, where he will find full directions for washing the prints satisfactorily. In the same place also are directions for trimming, drying and mounting Bromide prints, which apply equally to S.C.P. If desired prints on S.C.P. may be toned in any of the baths described on pages 55 to 59.

Wellington B.B. Paper.

WELLINGTON B.B. — the initials mean Brown-Black— is a development paper, intermediate in speed between bromide and S.C.P. In many important respects it differs from any of the papers previously described.

Bromide and S.C.P. with normal treatment give cool black tones. Subsequent toning allows of sepias and even reds being produced, but no really satisfactory method has been found whereby bromide paper can be made to yield warm black tones.

It is only necessary to examine a collection of good mezzotints to be convinced of the beauty and suitability of warm black for pictures in monochrome, and it is hardly surprising that photographers should again and again, but always without success, have sought for some simple means of imparting this colour to their prints and enlargements.

WELLINGTON B.B. gives a warm black tone by simple development, just as readily and just as unfailingly as WELLINGTON Bromide and S.C.P. give a cool black. A B.B. print, moreover, possesses a certain indefinable "quality" which distinguishes it from a print in any other process.

It would be futile to attempt to describe just what a good B.B. print is like. Only a trial of the paper, or an examination of some prints, can give any clear idea of this, but the following notes will be helpful to the reader in making a selection of the most suitable grade for his work.

WELLINGTON B.B. paper is manufactured in the following grades :—

SEMI-MATT	THIN and THICK.
TONED MATT	THIN and THICK.
WHITE MATT	THIN and THICK.
'XTRA SMOOTH	THIN and THICK.
BUFF	THICK ONLY.

B.B. SEMI-MATT possesses a particularly delicate surface, which is best described as being semi-matt without being semi-glossy. This grade retains when dry all the richness of the wet print and is of special value for small work and for the rendering of fine detail.

B.B. TONED MATT might almost as appropriately be termed B.B. Cream Matt, but the cream tint is so delicate as to be usually imperceptible except by reason of its general effect on the image.

There is no doubt that the cream toned base upon which this paper is coated greatly enhances its artistic value, and with a suitable subject the effect of the warm black image on the cream ground is strongly suggestive of a fine engraving. The " Thick " grade is well adapted to the making of prints and enlargements with wide margins.

B.B. WHITE MATT differs from the Toned Matt grade in that the paper is coated on a pure white base. The term " white " as applied to paper being capable of rather wide application it is as well to explain here that the base of B.B. White Matt is free from any suggestion either of blue or cream, and in texture is similar to fine, smooth, drawing paper.

B.B. White Matt is a paper which can hardly fail to appeal to the professional photographer who requires a white paper for " sketch " portraits and vignettes. With the Thick grade mounting may be dispensed with, the prints being enclosed in a folder and plate-marked or not as fancy may dictate.

B.B. 'XTRA SMOOTH is similar in most respects to the White Matt grade, but possesses a perfectly smooth grainless surface. It is especially suitable for portraits of children and ladies.

B.B. BUFF is coated on a base very much deeper in tone than that of the Toned Matt grade. On this grade landscapes

and portraits against dark backgrounds yield rich mellow results which would be difficult to obtain in any other way.

Those who admire the effect of Collodio-Chloride paper toned in gold and platinum will find in WELLINGTON B.B. an admirable substitute, giving results similar in colour and general effect and rendering toning wholly unnecessary.

EXPOSURE.

The advice previously given in regard to exposing bromide paper applies with equal force to B.B. With an average negative an exposure of from 10 to 12 seconds will be found approximately correct at 12 inches from a 16-c.p. lamp. It should be remembered that B.B. paper possesses quite exceptional latitude, and while this is a valuable property as a means of preventing waste, the photographer should not allow it to entice him into slipshod methods of working. As with any other paper, the best results will be secured by correct exposure and normal development.

DEVELOPMENT.

B.B. Paper being slower than bromide a stronger light is permissible in the dark-room during development. The reader is recommended to take full advantage of this, as it will render his work more pleasant and his results more certain. One thickness of yellow glass or fabric will be found sufficient to make any ordinary light perfectly safe.

Various developers may be used for the development of B.B. Paper, but the following are recommended :—

METOL-HYDROKINONE DEVELOPER.*

Metol	20 grains	1·2 grammes
Hydrokinone	90 ,,	6 ,,
Sodium Sulphite (crystals) ...	700 ,,	45 ,,
Sodium Carbonate (cryst.) ...	1000 ,,	65 ,,
Potassium Bromide	20 ,,	1·2 ,,
Water to	80 ounces	2 litres.

The above ingredients should be dissolved in the order given and kept in bottles filled to the stopper.

For warmer brown-black tones the potassium bromide may be increased to forty grains.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

If it is desired to use anhydrous instead of crystalline sodium sulphite and sodium carbonate the following proportions will be found correct :—Sodium sulphite 350 grains (22 grammes), Sodium carbonate 350 grains (22 grammes).

The Amidol developer given below yields tones rather colder than those produced by the formula above mentioned, but of exceptional depth and richness.

AMIDOL (DIAMIDOPHENOL) DEVELOPER.*

Sodium Sulphite (cryst.) ...	480 grains	30 grammes
Amidol (Diamidophenol) ...	35 ,,	2·2 ,,
Potassium Bromide	20 ,,	1·2 ,,
Water to	20 ounces	500 c.c.

This developer will keep in good condition for three days only.

The Borax-M.Q. formula given on page 15 is also very suitable for the development of B.B. Paper. The image is warmer in tone than that obtainable with the developers mentioned above and slightly softer.

As previously mentioned, B.B. paper possesses remarkable latitude and a print over-exposed within reasonable limits may be saved by shortening the period of development. The aim of the worker, however, should be to produce by correct exposure and normal development, prints, not only good in quality, but of perfect uniformity. He should, therefore, endeavour to use his developer always at a standard temperature (from 60° to 65° Fahr. is the most suitable) and develop for a standard time. Unless intended for Sulphide toning there is no need to develop a B.B. print to finality, as is recommended in the case of bromide papers. The print will be all the better, so to speak, for having when development is complete a little exposure in reserve. At 65° Fahr. development will be finished in from one and a half to two minutes. The worker should remember that the warm black tone obtainable on B.B. Paper is produced with unfailing regularity, provided the developer is used for a standard period at a uniform temperature.

A B.B. print as it lies in the developer always appears a shade or two darker than it does after fixing. This should be allowed for in developing.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134

FIXING AND WASHING.

When development is complete the print may be transferred direct to the following fixing bath. A brief rinse of not more than a few seconds' duration between development and fixing will do no harm, but anything in the nature of a prolonged wash should be avoided.

Fixing Bath.

Hypo	4 ozs. ...	100 grms.
Water to	20 ozs. ...	500 c.c.

Either the acid fixing bath, or the combined fixing and hardening bath given on pages 49 and 50 may be used if desired.

It should be noted that B.B. Paper fixes rapidly, five minutes being sufficient, provided the prints are kept separate, or maintained in motion, during the whole period of fixation. On no account should the prints be allowed to cling together during fixing.

WASHING.

A wash of thirty minutes in running water or in many changes will be found sufficient. After washing, prints may be dried in the usual way.

TONING.

B.B. Paper may be toned in any of the baths given on pages 55 to 59. The Hot Hypo and Alum Process will be found the most suitable, but the Sulphide process can also be used with success. If this latter method is employed the prints should be developed to finality, as is recommended in the case of bromide paper, preferably in the Amidol formula. B.B. Paper tones to a distinctly warmer shade than bromide.

FINAL NOTES.

B.B. Paper although slower than bromide, is quite suitable for enlarging.

Very soft or very hard negatives are not the best for B.B.

Paper. A good bromide or P.O.P. negative will be found the most suitable.

Do not under-expose.

Develop for a standard time, at a standard temperature, and the colour of your print will look after itself.

Remember that great over-exposure, coupled with brief development, will yield flat, muddy prints.

Enlarging on *Wellington* Bromide, B.B. and S.C.P.

FOR many years past, on the part of both amateurs and professionals, there has been a tendency to abandon the large camera, and to rely on enlargements from quite small negatives when big pictures are required.

This course has much to recommend it. Fast plates are now so perfect that one of the greatest drawbacks to hand-camera work has been removed, and on such papers as the WELLINGTON Bromide, S.C.P. or B.B., enlargements leave nothing to be desired on the score of quality.

In selecting suitable negatives for enlargement—or in making negatives from which enlargements are likely to be required—the reader should bear in mind that softness is to be preferred to brilliancy. A negative capable of making a good print with a reasonably short exposure on WELLINGTON Bromide or B.B. will probably yield an equally good enlargement, although many negatives are capable of giving better enlargements than contact prints, and it often happens that enlargement is the means of revealing unexpected charm in what seemed originally an unpromising subject.

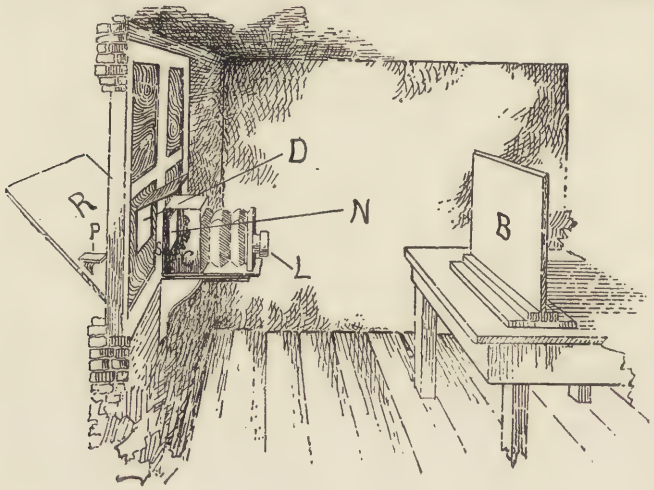
Enlarging is simply re-photographing, only for convenience certain alterations are made in the disposition of the apparatus. The photographer knows that as he gets nearer to his subject the image gets larger on his focussing screen, and the camera has to be extended more and more in order to secure sharp definition.

If a small negative is fixed so that it is evenly illuminated from behind, and we have a camera sufficiently large and capable of extending far enough, it will be possible to set such a camera in front of the negative, focus to the required size, and then using a piece of bromide paper instead of a plate, make a photograph of the negative. On development this will be found to be a positive print, just like a contact print of the same negative, only of a larger size. This is enlarging in its simplest form. But as, in order to get an enlarged picture, the lens of the camera must be nearer to the object—*i.e.*, the original negative—than the bromide paper is to the lens, and as the latter distance may have to be several times the focus of the lens, the extension required is so great that it is not usually convenient to employ a camera of the ordinary type and therefore some form of special apparatus is used.

ENLARGING BY DAYLIGHT.

The method which requires the least quantity of special apparatus is one in which the work-room itself becomes the camera, as shown in the sketch below.

The window of the work-room has been blocked up with an opaque shutter, so that no light can enter except through the



negative, shown at N. A reflector outside, R, is covered with white paper and so illuminates the negative evenly. On a support inside the room is placed the ordinary camera, with its lens pointing into the room, while at some little distance beyond is fastened a drawing board B, on which the bromide, B.B., or S.C.P. is fixed.

This it will be seen, is re-photographing, with the whole of the darkened work-room as the camera.

The bellows of the camera C only serve to block out strong light from the room, and a focussing cloth or some similar object must be put at S to make a light-tight joint between the back of the camera and the board carrying the negative. The focussing screen of the camera is of course removed, focussing being effected on a piece of white paper fastened to the easel B.

When such an arrangement is possible it forms a very cheap and convenient way of making enlargements, and the results will be found equal to those obtainable with the most expensive outfit. The only drawback is that it involves darkening a room and that work can only be done in daylight.

The lens L may be provided with a red glass cap, which is put on after focussing. This allows the image on the easel B to be seen clearly enough for the sensitive paper to be adjusted in the correct position, exposure being made by taking off the cap.

EXPOSURES IN DAYLIGHT ENLARGING.

As daylight is very variable, it will be found a good plan always to measure with an exposure meter the light falling on the reflector R, as nearly as possible at the moment of making the exposure itself. If this is done, and a note is kept of the stop used and of the negative, it is simple enough to ascertain approximately what exposure will be needed for any other negative. In enlarging, as in contact printing, different negatives require different exposures, according to their density and colour.

The stop value in enlarging differs completely from that engraved on the lens, and must be measured for the particular exposure in hand.

If the lens is fitted with an Iris diaphragm, we may measure once for all the diameter of the opening for the different stop numbers, by unscrewing the lenses and pushing into the iris, as far as it will go, a piece of card cut into a V shape. We can then make a list like the following :—

F/8 — $\frac{1}{2}$ inch diameter.
F/11 — $\frac{4}{11}$ inch diameter.
F/16 — $\frac{1}{4}$ inch diameter.
F/22 — $\frac{2}{11}$ inch diameter.
F/32 — $\frac{1}{8}$ inch diameter.

The measurements will of course vary according to the focal length of the lens employed. The above figures would be correct for a lens of a focal length of 4 inches.

This list is kept at hand when enlarging. When all is ready for exposure, the distance from the iris of the lens L to the easel B is measured with a tape measure, and this distance divided by the diameter of the stop. The answer is the real value of the stop that is being used.

An example will make this clearer. Let us suppose that the stop in use is that marked F/22 in the list above, and that the distance from the iris to the easel is found on measurement to be 35 inches. As F/22 has a diameter of $\frac{2}{11}$ inch, we divide 35 by $\frac{2}{11}$. That is to say, we multiply 35 by 11, which gives us 385, and divide this by 2, getting 192. So that under those circumstances we are using F/192 actually, although the stop is marked F/22.

This calculating may seem a bother, but it only takes a minute or two, and will prevent the waste of a great deal of paper in trying to guess at the exposure. Once having ascertained the true value of the stop, and the correct exposure necessary with any given negative, we have provided ourselves with some clear data which will be useful later on. Using the same stop, and the same negative, the exposure will always be strictly proportional to the time taken for the meter paper to darken.

It is well to have a little projection P on the reflector, where it will not interfere with the even lighting of the negative, and always to put the exposure meter on that projection when measuring the light. If the reflector cannot be got at from the outside, which will be the case if the work is being done in an upstairs room, the window may be opened at the bottom and a door provided in the blocking out board at D, so that the meter can be passed in and out.

Another example may help to make this clearer. Let us suppose that one day using WELLINGTON Bromide paper and f/192 we find that the exposure meter placed on P takes 28 seconds to darken to the standard tint, and that with a certain negative an exposure of 6 minutes proved to be correct. A week later, we want to make another enlargement of the same size from the same negative (or from one identical in density and in colour) and we test the light again and find that the meter new darkens in 16 seconds. A simple proportion sum gives us the exposure.

Six minutes are 360 seconds. We multiply the former exposure by the latter exposure-meter-time, and divide by the former exposure-meter-time. That is to say, we multiply $360 \times 16 = 5760$, and divide this by 28—$5760 \div 28 = 206$ nearly. The correct exposure under the altered conditions is therefore, 206 seconds, or, say, $3\frac{1}{2}$ minutes.

Should the degree of enlargement be altered, or the size of the stop, or both, it is easy to calculate the corresponding change in exposure. We must first find out, as described above, the new value of the stop. Then the exposure varies as the square of the " F " value of the stop.

Let us continue the example. We have just seen that under certain conditions we found that with stop f/192 the exposure was $3\frac{1}{2}$ minutes. But we will suppose that we have altered the scale of our enlargement, so that, on working it out, we find we are no longer using f/192, but f/150, and we want to know the corresponding exposure.

We multiply 192 by 192, getting 36,864, and 150 by 150, getting 22,500. Then we know that the exposure under the new conditions bears the same relationship to the exposure under the old conditions that 22,500 does to 36,864. We can ignore all the hundreds and deal with the thousands only. So the relative exposures are 22,000 and 36,000, or 22 and 36, or 11 and 18. Multiplying the three and a half minutes by eleven and dividing by eighteen, we get 2 minutes 8 seconds, which would be the exposure under the new conditions.

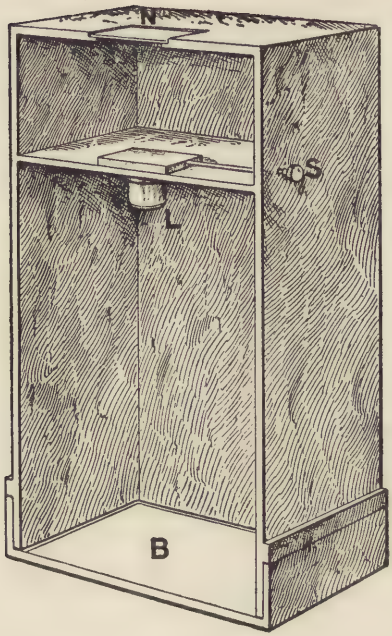
It is well to understand how to make these calculations, as they are all merely a matter of simple arithmetic, and if they take a minute or so to do, at least save the cost of the piece of bromide paper which would be wasted in the attempt to find out the proper exposure. Those who do not care to follow this course must make a trial exposure.

Before leaving this part of the subject, it should be pointed out that it is most important to ensure the easel being square with the negative, as otherwise the picture will be distorted.

If the lens used is that with which the original negative was taken, it will give a satisfactory enlargement to any size that may be required ; if not, the lens must be one that is at least capable, in the ordinary way, of covering a plate the size of the original negative right up to the corners.

FIXED FOCUS DAYLIGHT ENLARGERS.

There is another method of daylight enlarging, in which a special enlarging apparatus is employed. This may be adjustable to take negatives of different sizes, and to make enlargements of different sizes, but the form usually met with is not adjustable, but is a fixed-focus arrangement, in section similar to the sketch shown below.



As before, N represents the negative, L the lens, and B the bromide paper, S being a shutter actuated by a knob outside the apparatus, by which the exposure is effected. In its simplest form there is a lid at B, and the whole apparatus is taken into the dark-room, a piece of sensitive paper is put inside it at B, by means of the lid, which is then fastened, and the apparatus is carried out into the open air, so that there is an unlimited view of the sky above the negative N. The exposure is then made by means of the shutter S. Direct sunlight must, of course, be avoided.

In a fixed focus enlarger of this sort, there is no need to trouble about stop values, as the apparatus always works at the same stop.

Using the same brand of paper, and the same (or a similar) negative, the exposure will always be in proportion to the strength of the light as measured by a meter which can be placed on the top of the apparatus just before exposing. Once the correct exposure with a given negative is known and the time taken by the meter slip to darken has been recorded, all future exposures for the same or a similar negative can be worked out in the following manner :—

Multiply the number of seconds of the known (*i.e.*, first) exposure, by the number of seconds taken by the meter slip to darken under the new conditions, and divide by the number of seconds it took to darken when the known (*i.e.*, first) exposure was made. The answer will be the exposure required in seconds.

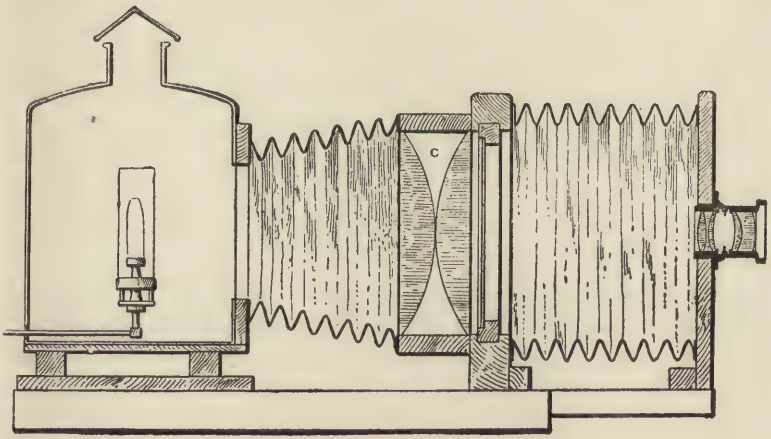
EXAMPLE.—It is known that on a certain occasion when the meter slip took 15 *seconds to darken a negative required* 40 *seconds' exposure. It is desired to make another enlargement from the same negative and it is now found that the meter slip takes* 12 *seconds to darken. To find the exposure required multiply* 40 *by* 12 *and divide by* 15. *The answer is* 32, *i.e., the number of seconds' exposure necessary.*

The fixed focus enlarger is a very simple form of apparatus, but much good work can be done with it. Its disadvantages are that the worker is limited to a particular size of enlargement, and that he has but few facilities for controlling his results by shading portions of the picture during printing.

The greatest number of enlargements, however, are made by means of an enlarging lantern.

ENLARGING WITH A LANTERN.

An enlarging lantern is simply a magic lantern, in which special care has been taken to prevent light leaking out into the room in which it is being used. The negative is put into the position occupied by the slide, and this having been sharply focussed on the easel, the lens is capped with the red glass cap, and a piece of WELLINGTON Bromide, B.B., or S.C.P. is pinned on the board and the exposure made.



The condenser is an important part of an enlarging lantern. It bends aside the rays of light so that they pass through the negative and also through the lens. A large condenser is a very heavy and costly thing and this limits the use of the enlarging lantern to relatively small size negatives. It is only for quarter-plate or 5×4 negatives that it enjoys any great popularity, though there are, of course, half-plate and whole-plate lanterns in use. For quarter-plates the lantern is as convenient a form of apparatus as can be desired. A form of lantern is made in which instead of a condenser behind the negative there is a reflector illuminated by one or two incandescent gas lamps so fixed that no light from them strikes directly on the negative. This apparatus works very well, but exposures are much longer than when a condenser is used.

The illuminant may be an oil lamp, an incandescent mantle, acetylene, electricity or the limelight. Any of these will be found suitable, and the choice is simply a matter of convenience, and should have no great effect on the quality of the enlargement. Properly managed, any one of these will give just as good results as any other. Perhaps the most convenient forms for the amateur are incandescent gas where gas is available, and a mantle and spirit burner where it is not.

The action of the condenser is to bend aside the rays of light, so that after passing through the negative they all pass through the lens, generally more or less through the middle of the lens. Consequently it may happen that the lens can be stopped down without cutting off any of the light passing through it. This is an important point for the enlarger to remember, namely, that when a condenser is used the effect of stopping down no longer follows the rules that apply when using the camera in the ordinary way. If the stop is altered, there is only one satisfactory way of ascertaining its effect upon exposure, and that is by a trial exposure.

In setting up an enlarging lantern for work, the first thing to be done after lighting up, is to put the negative in position and settle the size of the picture on the easel. This decides the position of the different parts, and it is only a waste of time to attend to the even illumination of the picture before this has been done.

When the negative has been focussed on the easel it is taken out again and the position of the light altered until the screen shows a perfectly even illumination. Some forms of enlarging lantern have the position of the light fixed once for all, but in most there is scope for a little adjustment to get the best result. The negative is then put back and focussed as sharply as possible, the red cap is put on the lens and the exposure made.

The processes which have been described up to the present are those which differ according to the form of enlarging apparatus in use; what follows applies to all enlargements on bromide, B.B. or S.C.P., unless otherwise stated.

Focussing should be done on a sheet of white paper the same size as that which is to be exposed. This makes it easy to select with certainty the exact part of the original negative which is to appear in the enlargement.

It will be found that little pinholes or specks in the negative are the best guides to the sharpness or otherwise of the focussing, because the details of the original may not be quite sharp, but the edges of a pinhole are sure to be.

It is a mistake to use a smaller stop than is necessary to get the required definition. It not only prolongs exposure, but with some forms of illumination it makes the lighting uneven.

In enlarging either with the camera by the method first described or with an enlarging lantern, the photographer can stand beside the sheet of paper on the easel and by means of cardboard can shade parts of the picture so as to let the rest have longer exposure and thus print darker. This is a very valuable power, and a great deal can be done to improve the result, with comparatively little skill. The card must be held well away from the face of the paper on the easel, or must be kept moving, to prevent its edge from showing as a hard line. If all but a small piece of the picture is to be darkened in this way, a ball of cotton wool may be fastened to the end of a wire, and used to shade the one part that is not to be darkened, while if only one small portion is to be darkened a card with a hole cut in it may be so held that the light passes through the hole, while the card screens the other part of the image.

PUTTING CLOUDS INTO ENLARGEMENTS.

It is a comparatively easy matter to print clouds into enlargements. The landscape is first sharply focussed on to a large piece of paper on the easel. This must be larger than the bromide paper, as it must project on either side of the bromide paper when this is pinned on. On this is placed a piece of card, also a little larger than the bromide paper, and on this the skyline of the landscape is carefully drawn with a sharp pencil. The card is then cut into two pieces along this line with a sharp knife. This gives two masks which may be used to shade the landscape while the sky is being exposed, and the sky while the landscape exposure is being given. As there is no visible image on the bromide paper, it is not possible without some guide, to know where the skyline of the landscape comes, so that one of the masks is put back on the easel in its original position and its outline traced in pencil on the white paper. That part of the outline which will be covered up by the bromide paper need not be marked, but the two extremities which will be seen when the bromide paper is pinned up, should be clearly shown. If the whole of the negative is to be got on the bromide paper, there will, of course, be no skyline beyond its edges, in which case the outline on the card may run off in a straight line where it is marked on the paper on the easel. The idea is, of course, to provide some guide, so that after the landscape negative has been put in the enlarger and the exposure made, and the cloud negative substituted, one may know where to hold the card mask so that it protects the invisible landscape image on the paper, while the cloud exposure is being given. The masks must be kept moving as before, and it will be found advisable to use the sky mask when exposing for the landscape, even if this has a fairly dense sky.

There is another method of putting in clouds with which some workers are very successful. In this the landscape is first exposed, shading the sky as much as possible, and is then developed. If the exposure is correct, a little longer in the developer does no harm, so that after the paper is developed, it can be washed for a minute or two, drained, pinned up again on the easel while still wet, and exposed for the clouds, shading the landscape with a card,

This is easily done, as the picture is, of course, quite visible. The enlargement is then put back into the developer until the clouds have developed, and is then fixed in the ordinary way.

This method should not be used if sulphide toning is contemplated, as there will always be a risk of the landscape, by reason of the long development it has undergone, toning to a colder colour than the sky.

BOLTING SILK IN ENLARGING.

Some very effective enlargements may be made by the help of a material known as " bolting silk " or " bolting cloth," and sold under that name by most of the large photographic dealers. It is a fine even textured fabric, made primarily for sifting or bolting flour. A piece a little bigger than the largest enlargement that is to be made should be obtained and stretched on a frame, or else mounted by its edges to a clean piece of glass, for protection. It is used by being placed just in front of the bromide paper, on the easel. If it is placed with the bolting silk in contact with the bromide paper it breaks up the image into a series of little dots something like a very fine half-tone picture in a magazine. This is useful if the original negative is too harsh in its contrasts, as the deepest shadows do not then come so black and the result is more harmonious.

If it is separated from the bromide paper by about the thickness of an ordinary sheet of glass, this texture can no longer be seen, but the effect is to soften the lines of the picture. The further it is from the paper the greater will be the diffusion, and in this way any degree of softness that may seem necessary can be secured at will.

It is quite a different softness from that got by leaving the picture out of focus, and is often the making of an enlargement, which without some such device would be cuttingly sharp. It also hides pinholes and other slight blemishes on the negative. A magnificent effect can be secured from a suitable negative by enlarging very considerably on WELLINGTON Cream Crayon paper, using bolting silk to soften the definition, and then sepia

toning the result. A quarter-plate or smaller negative can in this way provide a striking picture 24×18 or even larger.

It is important when using bolting silk, to have the separation between the bromide paper and the silk uniform over the whole enlargement. If it is not, the character of the definition will alter unpleasantly in different parts. For this reason, it is best to stretch the silk on a sheet of glass. If no separation is required, it is then pressed down on the bromide paper and secured with dark-room pins. If a slight separation is required, it is turned so that the glass side is in contact with the bromide paper and fastened as before.

CHIFFON IN ENLARGING.

Chiffon can also be employed for creating diffusion in enlargements. All that is necessary is to place one, two or three thicknesses of the material, according to the degree of diffusion required, over the enlarging lens. There is a distinct advantage in using chiffon in preference to bolting silk, as all that is required is a small piece sufficient to cover the lens and allow a margin of an inch or two, which is placed over the lens mount and held in position by an elastic band. Fixed in this way, the same piece of chiffon can be used for all sizes of enlargements. With bolting silk, the piece used must be sufficient to cover the biggest enlargement to be made and if large sizes are being dealt with, this becomes somewhat unwieldy.

The enlarged image should be focussed sharply on the enlarging easel and the chiffon then placed in position as described above. It will be found that the use of diffusing material necessitates an increase in the exposure, but not sufficient to cause any inconvenience in working.

The subsequent operations in enlarging are the same as for contact prints.

DIRECT ENLARGING ON S.C.P.

While the greater sensitiveness of WELLINGTON Bromide and B.B. paper over S.C.P. makes them more extensively used for enlarging, it must not be supposed that enlargements cannot be

made on S.C.P. With fixed focus or other enlargers using daylight, the exposures are quite short. For example, with a good stainless negative, and an enlarging apparatus in which the lens is working at an aperture of f/32 ascertained as above described, if a Watkins' meter be laid pointing up to the sky beside the enlarger, the exposure with S.C.P. will be about as many minutes as the meter paper takes seconds to darken to the standard tint.

When enlarging by incandescent gas from quarter-plate to whole-plate, with an enlarging lantern and a condenser, using a quarter-plate R.R. lens at full aperture—the effective aperture of which would under the circumstances be about f/24—the exposure on S.C.P. would be something like half an hour.

It will be seen that these exposures are by no means prohibitive in length, and one gets all the comfort of using a gaslight paper which can be developed in any ordinary room illuminated by artificial light.

The photographer is cautioned, however, against making the enlargement in a well-lighted room. The paper may be adjusted and pinned up with the same light in the room as is used for the development of S.C.P., but the room should then be darkened, as, if the paper is exposed to the general illumination during the whole time necessary for the exposure, it will certainly be fogged. Otherwise no special precautions need be taken. If there is a fire in the room, it will do no harm, provided it is screened so that no direct light falls on the S.C.P.

For winter evening enlarging, S.C.P. will be found a very convenient medium, while for richness and delicacy its results leave nothing to be desired. Generally speaking Soft S.C.P. is preferable to Vigorous S.C.P. for enlarging purposes.

Wellington P.O.P.

* * *

P.O.P. is one of the older photographic processes. The great advance which has been made during recent years in the manufacture of development papers, such as the " WELLINGTON " Bromide, S.C.P. and B.B., has deprived P.O.P. of the unrivalled position it once held. There still remain, however, many purposes for which it is unequalled. For richness of gradation it is almost unsurpassable, and there is beyond doubt a real charm in being able to watch the gradual appearance of the photographic image under the action of light.

WELLINGTON P.O.P. is characterized by excellent keeping properties and by a remarkable freedom from " double tones." It is made in the following grades :—

GLOSSY, MATT, CARBON, THICK GLOSSY, THICK, MATT, THICK CARBON, and also in post-cards.

A special grade, called Tropical P.O.P., is manufactured for use in hot climates.

WELLINGTON Self-Toning P.O.P.

This paper dispenses entirely with the gold toning solution, the prints being placed direct in the fixing bath and allowed to remain there until the desired tone is obtained.

It is made in four grades :—GLOSSY, MATT, THICK GLOSSY, THICK MATT, and also in post-cards.

Wellington

P.O.P.

GENERAL HINTS ON PRINTING.

THE term P.O.P. is a contraction of "printing-out paper" and is applied to photographic papers in which the image prints out and can be watched during printing. Whilst P.O.P. presents the advantage that the depth of the image can be judged by looking at the print itself, it presents the disadvantage that it can only be printed in bright daylight or by some intense artificial light, such as the electric arc.

In ordinary artificial light P.O.P. can be handled freely, and the packet can be opened and the paper put into the printing frames in an ordinary room in daylight, provided the exposure to the light is not unduly prolonged and the light itself is not very strong. For example, printing could be done on the window sill of a room, and the frames could safely be filled and emptied on a table a few feet from the window.

As with Bromide paper, and if anything to an even greater extent, it is important not to finger the surface of the paper. In fact, except at the extreme edges which are to be trimmed off when finished, it is best not to touch the sensitive surface at all.

It is easy to tell which is the sensitive side of the paper. It is, of course, the shiny side, in the case of the Glossy and Carbon papers, while in the case of the Matt, the sensitive side is smoother, whiter, and more finished looking than the bare paper on the back. There is always a slight tendency for the paper to curl with the coated or sensitive side inwards.

WELLINGTON P.O.P. is so packed as to remain in good condition for many months. If a packet is opened, and all is not used, the remaining pieces should be wrapped up as before, replaced in the envelope, and put aside, preferably under a book or weight. It is best kept in a cool place, and should on no account be stored where gas fumes or the fumes from the sodium sulphide used for toning bromide paper, can gain access to it. It is well to remember that while the air in a room may seem quite pure, that near the ceiling may be both hot and foul, and a high shelf is therefore always a very bad place on which to keep P.O.P., or for that matter any other sensitive material. A slight discoloration caused by improper keeping may disappear in the processes of toning and fixing, but if it is strongly marked the paper is spoilt.

Printing is best carried out in as bright a light as possible, short of direct sunlight, which is always to be avoided. If the negatives are very thin, a piece of green glass, or if that is not available, green or white tissue paper, placed over the frame, will enable a more vigorous print to be obtained.

The depth to which printing should be carried is easily learnt. There is a certain amount of falling off in the processes of toning and fixing which must be allowed for, but this is not very great. The prints when taken from the frame must, therefore, look a little darker than it is desired that they shall be when finished.

If the paper or the negative is damp, or if either become damp during printing, the silver salts in the paper will affect the negative giving rise to dark spots called silver stains. If these spots are not very intense they can sometimes be removed by placing the negative for an hour or two in the combined toning and fixing bath, to be described later on. The negative must then be thoroughly washed and dried.

Another method of removing silver stains is to rub the negative lightly with metal polish (" Globe," or one of the liquid polishes is suitable), applying with a tuft of cotton wool and polishing off with a clean piece. The surface of the negative will now look almost as shiny as glass, and the stains will have been greatly

reduced in intensity. The negative is then placed in a clean fixing bath for an hour or so, when most of the stains will entirely disappear. Thorough washing is, of course, necessary to complete the operation.

When a fair number of prints are ready they can be toned or, if self-toning paper is used, finished as described later. Whatever the kind of WELLINGTON P.O.P. employed, it should be remembered that to secure the best results the prints should be finished the same day as printed. Moreover, prints are never so good if the printing itself is begun on one day and finished on the next.

TONING P.O.P.

Before toning the prints must be washed in several changes of water, or better still, in running water. This need not take more than a quarter of an hour, but it is important, if the toning is to be easy and regular, that it should be done thoroughly. In this, as in other processes, it is not sufficient to leave a number of prints in water lying on the top of one another ; they must be separated, and separately drained when transferring from one bath to another. After the washing the prints must be placed quickly, one at a time, in the following toning bath :—

THE SULPHOCYANIDE TONING BATH.*

Ammonium Sulphocyanide ...	20 grains	3 grammes
Gold Chloride	2 ,,	30 c.c. (1% sol.)
Water to	16 ounces.	1 litre.

An excess of the sulphocyanide beyond the quantity given should be avoided, or pink high-lights and half-tones, and the defect known as double toning, *i.e.*, red shadows and bluish high-lights may result. The sulphocyanide must be dissolved in the water first, and then the gold, previously dissolved in water, added. A deep red colour will be seen for a moment, and as soon as the solution is free from this it is ready for use. Sixteen ounces (450 c.c.) are sufficient for twenty-four half-plate prints. (For instruction regarding the preparation of the gold chloride solution, see page 128).

It is most important that the prints be kept moving while in this solution. They should be turned over and over, the bottom

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

one being continually placed on top, so that each print receives attention in turn.

JUDGING THE DEPTH OF TONING.

The progress of toning must be judged by transmitted light, that is to say, by the appearance of the prints when held up to the ligut and looked through. The exact depth to which they should be toned is to be recognised without difficulty when one or two have been made. It is most important, however, if the prints are to be turned out in a uniform manner, that toning shall always be done in the same light—that is to say, if daylight is generally used, the worker will find himself all astray if he tries to tone his prints to a similar tone by lamplight. This remark applies to all toning processes of every kind which depend on the operator stopping them when he judges the right stage to be reached. By incandescent gaslight the daylight worker can judge his tones fairly well, though still not accurately, but by lamplight or ordinary gaslight the same tone will look entirely different.

It should be remembered in toning prints that they always dry a good deal colder in colour than they appear when wet. They should, therefore, be taken from the toning bath while still decidedly red if a warm tone is desired. If a colder shade is wanted, then toning must be stopped at the purple-red shade. Care should be taken not to over-tone, otherwise flat, colourless prints will result.

A quantity of solution sufficient for a given number of prints having been prepared, the whole of the prints to be toned should be placed in the bath as quickly as possible, taking care that each is placed well under the solution, kept moving, and that none of the prints are allowed to cling together. The batch having been toned the solution should be discarded and fresh used for the next batch. If the proportion given above, *i.e.*, 16 ounces of solution for twenty-four half-plates, is observed there will be little waste of gold. Strengthening up an old bath for use on a second occasion will have the result of producing inferior prints without effecting any economy in chemicals. Rather less than the above quantity

will be necessary for vignettes or for prints to be toned to a warm colour.

Too many prints should not be placed in the toning bath at a time, or they cannot be properly watched. As soon as it is judged that toning has been carried far enough, the print is removed and placed in clean water. In this it must be kept moving for the first minute or so and the water changed, or the toning action will continue and the print when finished will be of a colder tone than was intended.

THE FIXING BATH.

The prints are transferred one by one from the washing water to a solution of hypo. The strength recommended is—

Hypo	2 ounces	50 grammes
Water to	20 „	500 c.c.

This should be made some little time before use, as freshly dissolved hypo falls to a very low temperature, and is consequently slow in action. The prints must remain in the solution for at least ten minutes, and must not be left in a solid mass, but should be kept moving separately all the time. More prints go wrong through imperfect fixing than through insufficient washing.

COMBINED TONING AND FIXING.

Many people like to use one solution for the two-fold purpose of toning and fixing ; and while the Combined Bath is not to be recommended, it will give very beautiful tones, with a minimum of trouble.

When this method is to be used, the prints should first be treated by immersion for ten minutes in a solution of half-an-ounce of sodium sulphite (15 grammes) in a pint (550 c.c.) of water This preliminary treatment with sodium sulphite prevents after-yellowing of the prints by age. After thorough washing in many changes of water, they are then toned and fixed in the following solution :—

COMBINED TONING AND FIXING BATH.*

Hypo	8 ounces	260 grammes
Citric Acid	20 grains	1½ ,,
Alum	200 ,,	14 ,,
Lead Acetate	20 ,,	1½ ,,
Hot Water to	30 ounces	1000 c.c.

The hypo is first dissolved in the hot water, and then the other ingredients are added in the order named. The bath is allowed to stand until cold, and the clear liquid decanted or filtered off for use. Of this liquid six ounces (180 c.c.) are taken, and one grain (7 c.c. of 1 per cent. solution) of gold chloride, dissolved in water, added. As in other cases, the prints are much colder in tone when dry.

FIXING "SELF-TONING" PAPER.

This paper is printed in the same way as the other kinds of P.O.P., and always decidedly darker than the finished print should appear. Prints on single weight paper should be placed in the following bath without washing, but post-cards and prints on the double weight grades should first be washed in running water for 5 minutes.

FIXING BATH.

Hypo	6 ounces	300 grammes
Water to	20 ,,	1 litre

This fixing bath should be rendered alkaline by the addition of 30 grains (2 grammes) of bicarbonate of soda, which prevents sulphur-toning and subsequent fading of the print. The fixing bath should not be of a lower temperature than 60° Fahr. Fixing should be carried on until the desired tone is reached, which should not take less than eight minutes; it should be followed by a thorough washing, for from half to one hour, in running water if possible, if not, with frequent changes. It should be pointed out that this paper is liable to slight yellowness with age, which, however, entirely disappears in the fixing bath and is in no way detrimental to the quality of the finished print.

The darker the print, the stronger the fixing bath, and the longer the prints are allowed to remain in the fixing solution, the

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

colder will be the resulting tone. The prints should not be allowed to float on the surface of the fixing bath, or they may become stained. When dry, the prints always appear several shades colder in tone than when wet.

WASHING, DRYING, MOUNTING, ETC.

The prints now require washing. There is no need to repeat the instructions previously given, as in all these respects P.O.P. and Bromide paper require identical treatment. The reader should therefore turn to pages 51 and 52 and follow the directions there given.

GLOSSY SURFACE P.O.P. PRINTS.

Some workers desire their prints to possess the highest possible glaze, and for this purpose Glossy P.O.P. is unequalled. Prints intended for glazing should be allowed to dry in the usual manner, and should then be re-wetted. In the meantime glass, pulp glazing slabs or ferrotype plates should be prepared to receive them by being treated with a solution of wax. This is made by dissolving 60 grains of beeswax cut up into shreds in ten ounces of benzol (4 grammes in 300 c.c.). It should be shaken at intervals for a day or so, and then the clear solution of wax poured off into a well-corked bottle for use. The glass or ferrotype plates, previously thoroughly cleaned, should be waxed all over by applying a little of this solution with a rag or tuft of cotton wool, and then polished with a clean cloth. The wet prints are laid face downwards on the glass or ferrotype, squeegeed into contact, and allowed to get thoroughly dry before they are removed. On no account must any attempt be made to dry them by excessive heat.

If preferred, talc (French chalk) may be used with glass plates in lieu of the glazing solution above mentioned. The talc is dusted over the plate, well rubbed in with a tuft of cotton wool or a clean cloth, and the surplus lightly polished off.

Wellington

Lantern and S.C.P. Lantern Plates.

GENERAL REMARKS.

IT has been said that the finest way to display a perfect negative is by means of a good lantern slide. A lantern slide is nothing more than a print on glass; but to allow of the slide being shown in the usual form of lantern, there is a standard size for lantern plates, namely, $3\frac{1}{4}$ inches square (in the United States the standard size is 4 inches by $3\frac{1}{4}$ inches). The consequence is, that unless the picture that we wish to make into a slide is on a plate not larger than a quarter-plate, and does not occupy even the whole of that, the negative must be *reduced* on to the lantern plate.

Reduction is in no sense different from enlarging, except that in enlarging the distance between the lens and the Bromide paper is greater than between the lens and the negative, while in reduction the distance between the lens and the lantern plate is less than that between the lens and the negative.

When the picture on the negative is already of a suitable size, the slide can be made by contact printing as with a piece of Bromide paper.

WELLINGTON Lantern Plates are made in two distinct grades, *viz.* :—

THE WELLINGTON LANTERN PLATE, which is intended for use in the dark-room, and

THE WELLINGTON S.C.P. LANTERN PLATE, which can be handled in ordinary subdued artificial light, in the same way as the WELLINGTON S.C.P.

Both grades are suitable for contact printing or reduction, but for reduction the WELLINGTON Lantern Plate will be found the more suitable, although with a powerful illuminant, such as daylight or the electric arc, the S.C.P. Lantern Plate can be used with equal success.

A valuable property of both these grades of lantern plates, and especially of the S.C.P. Lantern Plate, is that it is easy to vary the colour of the slide by increasing the exposure and modifying the developer in the manner described hereafter.

A PRINTING FRAME FOR CONTACT SLIDES.

It is quite possible to make slides by contact in an ordinary printing frame. The negative is placed in the frame, the lantern plate adjusted in the required position, the back replaced, and the exposure made. There is, however, always a risk of scratching either the negative or the lantern plate, as the one is slid over the other to decide which is the best position for the lantern plate to occupy. To prevent this various patterns of lantern slide printing frames have been put on the market. It is quite easy to adapt au ordinary printing frame to this purpose. A frame should be selected decidedly larger than any of the negatives from which slides are to be made. A half-plate printing frame is, for example, a very good size for quarter-plate negatives. A piece of clean glass is first placed in the frame and fastened in position by gluing over it a piece of black paper larger than the glass, the edges being attached to the frame. In this paper a hole $3\frac{1}{4}$ inches by $3\frac{1}{4}$ inches is cut so as to come in the exact centre of the glass. Instead of the usual hinged back, one piece of flat wood is fitted, its underside covered with smooth felt or cloth, and a hole cut in its centre also, a shade larger than $3\frac{1}{4}$ inches by $3\frac{1}{4}$. A little door, $3\frac{1}{4}$ inches by $3\frac{1}{4}$,

may be hinged to the opening with a piece of cloth, and a button or spring fitted to keep the door closed when required, and the frame is complete. To use this, the back is taken out and the negative laid on the glass and shifted about until the exact part from which the slide is to be made is seen to occupy the desired position in the opening left in the black paper. The solid back of the frame is then put in, and fastened with the ordinary springs of the frame. The lantern plate can then be dropped in the opening in the back with the certainty that it will fall exactly where it is wanted, and without any risk of scratching the negative. If two or more slides are wanted from the same negative they can be made with one adjustment.

EXPOSURE.

The exposure necessary depends, of course, upon the strength of the light used and the density and colour of the negative. As a rough guide, using the WELLINGTON Lantern Plates, three seconds at three feet from a 16 c.p. lamp will be found approximately correct for average negatives.

LANTERN SLIDES BY REDUCTION.

Before proceeding to describe the development of lantern plates, it is well to say something about making slides by reduction, because, although the process is very different from the contact method just described, the development and after processes are the same, the difference being in the matter of exposure only. The simplest method of making slides by reduction is by means of a fixed-focus reducing camera. This has a holder at one end to take the negative, and another at the other end to take the lantern plate. Between the two is a lens. The whole arrangement is so fixed that the image of the whole of the negative is sharply focussed on the lantern plate of the required size. The camera, in the simpler forms, is taken bodily into the dark-room for the insertion of the plate, and is then carried out and stood on end in the open air so that the uninterrupted light of the sky may shine straight down through the negative. Needless to say, direct sunlight should be avoided. After an exposure, regarding the length of which no

hint can be given, as it depends on the character of the negative the strength of the light, the degree of reduction and the stop in the lens, the camera is carried back and the plate developed. Other forms of fixed-focus reducing cameras are provided with a dark slide, so that it is not necessary to carry the whole apparatus into a dark-room for loading. Other lantern slide cameras are so arranged that the negative can be focussed, and any desired degree of reduction obtained.

Slides may be made by reduction without any special apparatus other than an ordinary camera provided with a carrier to take a lantern plate. The negative to be reduced must be fixed in front of an opening in a piece of wood or card, so that the surrounding light is cut off from the camera, and the negative is illuminated from behind. This may be done in daylight by fixing a white card, larger than the negative, at an angle of 45° behind it, and placing the whole arrangement where the light from the sky can shine down on the card. Or artificial light may be used. A paraffin lamp or a gas burner with a big ground-glass globe makes an excellent illuminant for a quarter-plate, but with larger sizes something more elaborate is necessary to get even illumination, One of the simplest plans is to take two pieces of fine ground glass. an inch or two each way larger than the negative, and to fix them one inch apart from each other and the nearer one at least one inch behind the negative. Almost any illuminant can be used behind such an equaliser. Incandescent gaslight does very well, or magnesium ribbon may be burnt. In front of the negative the camera is set up, and the image sharply focussed on the screen to the required size. A WELLINGTON Lantern plate is then put in the slide and exposed.

It is well to note that the camera and negative should, preferably, be supported on the same board or table, to prevent independent movement, which would cause blurring. The focussing must be done very carefully, and if necessary the lens should be stopped down. There is no need to cover in the space between the lens and the negative, if the card which surrounds the latter is large enough to prevent strong light from shining into the lens.

DEVELOPING WELLINGTON LANTERN PLATES.

For cold tones the hydrokinone formula given on page 26 or the following metol-hydrokinone developer will be found satisfactory :—

METOL-HYDROKINONE DEVELOPER.

Metol	... 20 grains	1 gramme
Hydrokinone	... 60 ,,	3 grammes
Sodium Sulphite (cryst.)	... 700 ,,	35 ,,
Sodium Carbonate (cryst.)	... 700 ,,	35 ,,
Potassium Bromide ...	... 6 ,,	0·3 gramme
Water to	... 20 ounces	500 c.c.

Dissolve in the order given, allowing each ingredient to enter completely into solution before adding the rest. For use dilute with an equal part of water.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

In many cases, however, a tone warmer than that given by the above developer is preferable, and for this purpose the following pyro-ammonia developer is recommended :—

PYRO-AMMONIA DEVELOPER.*

	No. 1.	
Pyrogallic Acid ...	... 1 ounce	50 grammes
Sodium Sulphite (cryst.)	... 2 ounces.	100 ,,
Citric Acid	... 40 grains	5 ,,
Water to	... 10 ounces	500 c.c.
	No. 2.	
Ammonia ·880 ...	... 1 ounce	50 c.c.
Water to	... 10 ounces	500 c.c.
	No. 3.	
Ammonium Bromide	... 1 ounce	50 grammes
Water to	... 10 ounces	500 c.c.

The single solutions keep well, but should not be mixed together until the developer is required for use. It is made by taking thirty minims of No. 1, sixty minims of No. 2 and thirty minims of No. 3, and adding one ounce of water (in metric measure, 30, 60 and 30 drops respectively may be taken to 30 c.c. of water). This developer gives warm black tones, the slides being developed in from two to two-and-a-half minutes.

If the quantity of No. 3 is increased, the rest remaining the same, warmer tones are obtained, getting browner and browner

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

as more and more of No. 3 is used. The exposure has to be increased at the same time, and the development takes longer. For decidedly warm tones the exposure may be as much as six times the normal and the quantity of No. 3 increased to ninety minims or drops. Development in this case will take five or six minutes. The warmer the tone of the finished slide the lighter will be the colour of the image as it lies in the dish, and this may prove very deceptive. It is best, therefore, to get into the habit of timing the development to prevent under or over-developing. Haphazard additions of bromide should not be made, and if anything like a fair proportion of the slides is to be successful, the photographer must make up his mind what tone he likes, mix his developer accordingly and stick to that developer until he is thoroughly familiar with it, making his exposures to suit that particular developer and no other.

PYRO AND AMMONIUM CARBONATE DEVELOPER FOR RICH SEPIA TONES.*

The following developer, with WELLINGTON Lantern Plates that have received from four to five times the normal exposure will give rich sepia tones, development taking two-and-a-half minutes.

	A.	
Pyrogallic Acid ...	... 1 ounce	27 grammes
Sodium Sulphite (cryst.)	... 4 ounces	100 ,,
Water to	... 20 ounces	500 c.c.
	B.	
Ammonium Carbonate	... 480 grains	30 grammes
Potassium Hydrate ...	... 360 ,,	22 ,,
Potassium Bromide ...	... 240 ,,	15 ,,
Water to	... 10 ounces	250 c.c.

One dram each of A and B are taken, and water is added to make one ounce (4 c.c. of each, to make 30 c.c. in all).

THE WELLINGTON S.C.P. LANTERN PLATES.

Most of the foregoing remarks apply equally to the S.C.P. Lantern Plates, except that with them no dark-room is necessary and all operations can be carried out in a room illuminated by ordinary artificial light. Care should be taken not to expose the plate to strong direct light, but at about 8 feet from the illuminant, or screened from its direct rays, the plate can be handled with perfect safety.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

The following developer is recommended :—

METOL-HYDROKINONE DEVELOPER.*

Metol	... 20 grains	1 gramme
Hydrokinone	... 60 ,,	3 grammes
Sodium Sulphite (cryst.)	... 700 ,,	35 ,,
Sodium Carbonate (cryst.)	... 700 ,,	35 ,,
Potassium Bromide ...	... 6 ,,	0·3 ,,
Water to	... 20 ounces	500 c.c.

Dissolve in the order given allowing each ingredient to be completely dissolved before adding the next.

N.B.—All metol-hydrokinone developers should be used at a temperature of from 60° to 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

With the above developer and a negative of average density the exposure at a distance of 6 inches from a 16-c.p. electric light will be about one minute. If magnesium ribbon is used, ½ inch at about 18 inches from the negative will be found approximately correct. The tone obtained will be a particularly fine cool black. Development will take about 30 seconds.

Used in the above manner the S.C.P. Lantern Plate will be found particularly suitable for weak negatives, from which brilliant slides will be obtained without difficulty.

By increasing the normal exposure by about one-third, and adding potassium bromide to the developer very beautiful warm black and cool brown tones can be secured. Two grains (20 drops of a 10% solution) of potassium bromide to each ounce of developer will be found the best average proportion, but the quantity may be increased up to 20 grains if desired. Development with the addition of 2 grains of potassium bromide to the ounce will take about two minutes, the appearance of the slide as it lies in the dish being a reliable indication as to what its final density will be.

For decidedly warm tones the exposure must be considerably increased and the following Restrainer added in the proportions indicated.

RESTRAINER.*

Ammonium Carbonate	... 1 ounce	10 grammes
Ammonium Bromide ...	... 1 ,,	10 ,,
Water to	... 10 ounces	100 c.c.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

For rich brown tones 1 dram of this solution should be added to each ounce of developer, and the normal exposure increased by one-half. Development will take about 1 minute.

For very warm brown tones, two drams of Restrainer must be added and the normal exposure increased from three to four times. Development will take from 2 to 2½ minutes.

As with the WELLINGTON Lantern Plate, when ammonium bromide and ammonium carbonate are used as a restrainer the appearance of the slide as it lies in the dish is likely to prove misleading, and some method of timing should be adopted to prevent under or over-development. If the worker adheres to the times given above, namely 1 minute when 1 dram of Restrainer is added, and from 2 to 2½ minutes when two are used (the temperature of the developer being from 60° to 65° Fahr.), he will have little difficulty. If the results are too dense or too thin it is a sign that the exposure has been too long or too short as the case may be, and another slide should be made. A slide that shows signs of over-exposure may be saved by shortening the period of development, and an under-exposed slide may be saved by prolonging development, but in such cases the colour and gradation will be altered, and the slide may prove poor in quality. Correct exposure is a matter of judgment and experience, but, working by the above method, the photographer can always be sure that his development is correct. If the results are not what he desires he will know that it is the exposure that is wrong and can act accordingly.

It is, of course, quite possible to judge development in the ordinary way. If the worker decides on the tone he desires and suits his developer and exposure to that tone, a very little experience will show him just what a correctly developed slide looks like as it lies in the dish, and once this knowledge is obtained no slide need be spoilt through over or under-development.

A warm-tone slide always gains in depth on drying and becomes colder in colour. When taken from the fixing bath, a slide developed to a very warm tone will present a somewhat washed-out appearance. This, however, should not disturb the worker, as a gratifying

improvement will be apparent on drying, the slide gaining in richness and density.

WELLINGTON BORAX-M.Q. DEVELOPER.

The following Borax M.Q. formula, which has already been referred to in the chapters on Plate development and the development of S.C.P., can be used with very satisfactory results with the WELLINGTON S.C.P. Lantern Plate.

BORAX M.Q.*

Metol	... 20 grains	1 gramme
Hydrokinone	... 50 ,,	2·5 grammes
Sodium Sulphite (cryst.)	... 200 ,,	10 ,,
Borax (powdered) ...	... 200 ,,	10 ,,
Water (hot)	... 20 ounces	500 c.c.

Dissolve in the order given, allowing each chemical to be in complete solution before adding the next. This developer keeps almost indefinitely in well stoppered bottles.

N.B.—All metol-hydrokinone developers should be used at a temperature between 60° and 65° Fahr. Below 60° Fahr. hydrokinone rapidly loses its developing power and at very low temperatures becomes practically inert.

The addition of 1 drop of a 10% solution of potassium bromide to each ounce of solution is necessary to ensure freedom from fog. In colour the image will be a slightly warm black, and softer in contrast than that obtainable in the metol-hydrokinone developer previously given.

By increasing the exposure from two to three times and adding 10 drops of a 10% solution of potassium bromide to each ounce of developer, very pleasing brown tones will be obtained. Development will take from two to three minutes. With this developer it is easy to judge the progress of development, and the resultant image will be more transparent than that obtained when ammonium bromide and ammonium carbonate are used as a restrainer. Very warm tones verging on the red are not obtainable with this developer, but for the cooler and more artistic shades of brown it will be found highly satisfactory.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

FIXING, WASHING AND DRYING SLIDES.

When the lantern plate is taken from the developer it should be well rinsed in water and then fixed in a plain solution of hypo (4 ounces of hypo to 20 of water), or preferably in either the Acid Fixing Bath or the Combined Hardening and Fixing Bath given on pages 49 and 50.

It should be left in the fixer until the whole of the white appearance has gone from the back and for as long again. It is then taken out and washed in the same way as a negative. Before being put to dry, it is well to rub the film very gently with a tuft of cotton wool, while holding the plate under the tap. This gets rid of any deposit from the water. The slide can then be dried.

It is more important to dry a slide where dust cannot get at it, than it is to so dry a negative, as in the negative fine dust may be quite unnoticed, but in the slide it is magnified on the screen and becomes very obvious.

MOUNTING LANTERN SLIDES.

When dry a slide has to be masked, mounted and spotted before it is ready to be shown in the lantern. Masks of black paper can be bought, ready cut, but as this means that the picture must be made to fit the mask, it is better to use the plain gummed strips which are sold for binding slides. These are merely wetted and laid down on the film side of the slide so as to black out everything that is not to be shown on the screen. With a little care it is easy to keep the corners quite square and true. Some pieces of clean glass $3\frac{1}{4}$ by $3\frac{1}{4}$ inches will be wanted for cover glasses. Any spoilt lantern plates should be kept for this purpose, the film being cleaned off with hot water and a stiff brush.

Before binding up a slide it should be thoroughly dried in front of the fire. Then the cover glass is placed on it, and the two stuck neatly together, by binding round the edges with the gummed strips sold for the purpose.

It is now only necessary to "spot" the slide. Spotting is done to show which way the slide is to be put into the lantern.

Small round white spots, which may be cut out of paper, are stuck on the slide, so that when the slide is looked at in the hand, and the picture is seen the right way round, the spots are at the two top corners facing the worker. The lanternist then knows that if he puts such a slide into the lantern with the spots downwards and towards the light, the picture on the screen will be the right way up and the right way round.

REDUCING LANTERN SLIDES.

It is sometimes necessary to reduce a developed lantern plate which has been made too dense. The following solution will be found very convenient for the purpose. It is also useful for removing any tint on the sky which may seem undesirable, or for any other local reduction that may be needed. The reducing solution is made of :—*

Potassium Ferricyanide ...	120 grains	7 grammes
Water to	20 ounces	500 c.c.

A dram or two of this (3 to 6 c.c.) is added, just before use, to each ounce (30 c.c.) of ordinary hypo solution. The plate is immersed in the reducer when it is to be acted on all over, or if local reduction is required, the solution is applied with a small tuft of cotton wool or a camel's hair brush. The plate, after reduction, is well washed and dried.

TRANSPARENCIES.

WELLINGTON Lantern Plates are not intended to be used exclusively for making lantern slides. They will be found very suitable for transparencies which can be used for window and lamp decoration. For this purpose they can be supplied, like ordinary plates, in all sizes.

PRINTING CLOUDS INTO LANTERN SLIDES.

The operation of printing clouds into lantern slides, although not easy to describe, is by no means difficult in actual practice.

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

Two methods are at the disposal of the worker; he may print the clouds on to the same plate as the landscape, or he may print them on a separate plate, and bind this up film to film with the landscape so as to form a cover glass.

If it is desired to print the clouds on the same plate as the foreground, it is first necessary to cut two masks, one to cover the sky while the exposure of the landscape is being made, and the other to cover the landscape while the exposure of the sky is being made. This is best done in the following manner.

Take a piece of P.O.P. and cut it exactly to the size of a lantern plate ($3\frac{1}{4} \times 3\frac{1}{4}$). Place this on the landscape negative so as to include just the portion that is to be used for the slide, and with a finely pointed lead pencil, mark the exact position of the corners on the film of the negative. Now print until the horizon line is distinctly visible, and then neatly divide the paper along this line with a sharp knife or a pair of scissors. The two pieces of paper are then allowed to darken by exposing them to the light.

Take the sky portion and with a touch of gum or seccotine attach it, emulsion side up, to the glass side of the landscape negative, so that it exactly covers up the sky, taking care that the two top (*i.e.*, square) corners exactly coincide with the pencil dots on the film of the negative. If the mask curls away a little along the divided edge, so much the better, as it will help to soften the sky line when printing.

Now take the second or landscape mask, and attach this, emulsion side up, to the glass side of the cloud negative, marking the position of the two square (*i.e.*, uncut) corners on the film of the cloud negative with a lead pencil, as before. The cloud negative is now placed in the printing frame, a lantern plate adjusted over it so that two corners exactly coincide with the dots previously made, and the exposure is given. The cloud negative is then replaced by the landscape negative, the lantern plate adjusted so that its four corners correspond with the four pencils dots, and the exposure for the landscape is made. To avoid the mistake of printing clouds and foreground on the same half of the slide

it will be as well to mark the top of the lantern plate, after the first printing, before it is taken away from the cloud negative, with a small piece of black gummed paper. It will also be well to gently move the frame during both exposures so as to soften the sky line, and prevent a hard junction showing.

When two plates are used, one for the clouds and one for the foreground, the procedure is exactly the same, except that after printing the clouds or the landscape, as the case may be, instead of returning the same plate to the printing frame another is used. For this method, however, it will be necessary to mask the cloud negative with the P.O.P. mask, emulsion side down.

The principal advantage of this cover glass method is that either the landscape or the sky may be reduced in the manner described on page 108 if found to be too dense and the sky, if accidentally printed so as to overlap the landscape, may be locally reduced with the same reducer applied with a camel's hair brush.

Whichever method is used care should be taken that the sky in the finished slide is lighted from the same direction as the landscape, or an effect such as was never seen on sea or land will be the result. In this connection it is important to note that if the two-plate method be adopted the sky will be reversed from left to right, so that a negative of a sky lit in the opposite direction to that of the landscape with which it is to be combined must be chosen.

The Bromoil Process.

MANY pictorial photographers desire a printing process capable of greater control in the matter of gradation than is possible with P.O.P., Bromide or Gaslight papers. The print and the negative may both be perfect technically, but nevertheless may fail to convey the pictorial effect that the photographer had in his mind's eye when making the exposure, and to attain the desired result it may be necessary for him to alter the whole range of tones.

A process which renders this possible is that known as "BROMOIL," which combines in a remarkable degree the advantages of the Bromide process in the matter of printing and enlarging, with those of the oil-pigment process in the matter of control. In the Bromoil process the silver image of the bromide print is converted into an image composed practically of artists' oil pigment, the worker having almost as much control in the alteration of tones, the subduing of high-lights, and the darkening of shadows as is possessed by the painter-artist himself.

The process is within the range of every photographic worker as up to the point when the pigment is applied the process is purely photographic, and the "drawing" and rendering of detail of the subject have been achieved entirely by the photographic process. It is only in the final result that the worker with artistic aims has his chance of effecting improvements. One of the advantages of the method is that the whole of the work can be done by artificial light; that is to say, a bromide enlargement can be made and turned into a finished bromoil exhibition picture without the use of daylight at all. This offers distinct attractions to the busy worker.

THE BROMIDE PRINT FOR BROMOIL.

In theory any bromide paper may be used for bromoil, but it will be found in practice that the recently introduced WELLINGTON BROMOIL PAPER offers advantages over all others. Wellington Bromoil Paper is made in two grades :

White Smooth (Double weight.)
Cream Rough (,, ,,)

The bromide print should be developed with amidol or M.Q. developer, and should be a good, clean, fully developed print, with plenty of half-tones and without clogged shadows.

Before attempting the Bromoil Process the reader should fully master the art of bromide printing, which is described on pages 42 to 52.

The first essential is a good bromide print upon which to work, the bromoil process, as mentioned above, being founded on a combination of bromide printing and the oil-pigment process. In brief, the silver image of the bromide print or enlargement is replaced in the finished result by actual oil pigment, which incidentally renders the process an extremely permanent one.

To achieve this, a certain chemical action must be employed, as it would be obviously impossible to convert the image of the bromide picture into a bromoil by simply dabbing oil pigment on the surface of the print. If this were done, the result would be merely to smudge the pigment or " ink," as it is called, all over the surface equally, until the original picture was entirely covered up. To enable the oil pigment to " take " in the right places on the print—that is, where the shadows and half-tones are—it is necessary that the surface of the print should be rendered of such a character as to be receptive of oily substances in these parts only and in due proportion, whilst the high-lights of the subject must be so prepared as to resist the application of the pigment.

A RELIABLE BROMOIL BLEACHER.

To bring this about, it is first of all necessary to bleach the bromide print in much the same way that is adopted when sulphide toning ; but other chemicals are employed, and the success of the operation depends largsly upon the efficacy of this bleacher. Many

formulæ have been suggested from time to time, and all succeed more or less in their purpose, although some produce better results than others with different types of bromide prints.

A good all-round bleacher can be made from the following formula :—*

Copper sulphate	80 grains	5 grammes
Sulphuric acid	5 minims	5 drops
Potassium bromide	80 grains	5 grammes
Potassium bichromate ...	7 grains	0·4 gramme
Chrome alum	16 ,,	1 ,,
Water to	20 ounces	500 c.c.

The print most suitable from which to make a successful bromoil is one that in the ordinary way would be accepted as a " good " bromide print. Although it is quite possible to make bromoils from almost any type of bromide print, even from the thin, flat, over-exposed variety, there is no doubt that for ease in working and for the highest percentage of successful results a bromide print that is pretty good in itself, possessing good half-tones, clear high-lights and fairly dark shadows, is very desirable. It is well, therefore, when setting out to make a print that is to be converted into a bromoil, to bear this point in mind, and give, where possible, the correct exposure and full development.

It may possibly be asked : " If you have a good bromide print, why turn it into a bromoil at all ? " The answer is that there are very few bromide prints produced, be they never so good technically, that will not bear " pulling together " and strengthening in various ways to make entirely successful as pictorial compositions. There are spotty high-lights to be toned down, scattered masses to be brought together by other connecting masses, shadows to be made stronger, tone or modelling to be added to blank white spaces, etc. All this can be done legitimately by the bromoil process without in any way interfering with the outline and drawing given by the lens and plate.

PREPARING THE PRINT FOR PIGMENTING.

When the bleacher has been freshly made up according to the above formula, the print, which has been thoroughly well fixed,

* *Before making up any formula, read the notes on pages* 125, 126 *and* 134.

washed and dried, is placed in it. (It should be noted that the bleacher should be warmed up to a temperature of about 90 deg. Fahr.) Very rapidly the black and white image will disappear until a very faint, yellowish-grey image only remains. When the whole of the image is completely bleached, which may take a few minutes, the print is removed from the bleaching bath and washed in one or two changes of water, also of a temperature of 80 to 90 deg. F. It is then placed in a fixing bath composed of

Hyposulphite of soda	3 ounces	75 grammes
Water to	20 „	500 c.z.

This should, if possible, also be of a similar temperature to the washing water. The print is then finally washed for ten minutes or so to remove the last traces of hypo.

During this final washing process many workers find it an advantage to use a little ordinary yellow soap in one of the washing waters, forming a lather which is laved over the surface of the print. This assists the bleached image in its " taking " and " repelling " action towards the oily pigment.

The effect of the bleaching and washing on the print is not only to remove the black and white image so that the entire picture can be built up or " developed " on practically plain paper with oil pigment, but it will be found that where the shadows of the original image appeared on the surface of the print the gelatine is now much harder than where there was little or no image, as in the high-lights.

This difference can be readily detected by feeling the surface whilst wet, and in the case of pictures with strong contrasts a distinct relief can be observed, the high-lights being more absorbent of water and swelling a trifle above the surface of the paper, while the shadows are clearly below the level of the high-lights. In other words, the entire picture can, under certain circumstances, be seen in low relief. This, however, is not so essential and reliable a test of the correct receptiveness of the print for pigmenting as that demonstrated by the sense of touch. In a very little time

the worker in bromoil comes to know instinctively by feeling the surface of the wet print whether it is all right for inking up. The high-lights of the picture are distinctly "slippery" (for want of a better word) to the touch, while the shadows are harsh and with a suggestion of roughness.

The shadows of the original print have now been converted to such a state that they will readily accept and hold the pigment when applied with the correct dabbing action with a brush, whereas the high-lights, being charged with water, will repel the greasy ink, and the half-tones will take the ink in due proportion according to their depth of tone.

THE PIGMENTING PAD.

To keep the bleached print in condition for applying the pigment, it must be in a state of moisture. Therefore, after leaving the final washing water, it can be either pigmented at once, or dried and then subsequently re-wetted for pigmenting. Assuming, however, that the process is being continued, and the bleached and fixed print is taken straight from the washing water for pigmenting, it is kept moist by being placed on a pad of wet blotting paper. This pigmenting pad is best prepared by taking, say, a dozen sheets of clean white blotting paper, wetting them one at a time, and placing on a sheet of glass, zinc or some other hard level surface. The blotting paper pad should, of course, be made larger in all directions than the print which it is desired to pigment. The reason for laying the damp blotting paper down a single sheet at a time is to enable the final pad to be quite flat and compact. If the pad of a dozen sheets were wetted when in contact, they would probably cockle up in an awkward fashion that would prove fatal to the production of a perfectly level surface for working upon.

The pigmenting pad is kept wet whilst in use, and the print is taken straight from the washing water and laid face upwards upon it. The gelatine surface of the print is then lightly blotted over with a sheet of blotting paper or a clean smooth cambric handkerchief. When all visible moisture has been removed, the print is in a proper condition for pigmenting.

PIGMENTS, BRUSHES, ETC., FOR BROMOIL.

The pigments or " Inks " are sold in collapsible tubes similar to the ordinary oil colours used by artists. They are obtainable from many dealers who specialize in oil and bromoil materials. For the beginner, two tubes of oil pigment will be sufficient—a black and a brown, say burnt umber. Later, when you get more at home with the process and wish to secure different effects, the colour range of your palette may be increased and other colours included. But we do not recommend a great variety of positive colours in any case, unless you are trying bromoil in colours ; that is to say, endeavouring to reproduce a scene in a number of natural colours. In the ordinary way a monochrome bromoil in either black, sepia, brown-black, or blue-black will give as much variation in effect as can be regarded as desirable for pictorial purposes.

In addition to a couple of tubes of pigment, two or three pigmenting brushes will be needed. It is as well to provide the right kind of tools at the outset rather than endeavour to potter along with inadequate or makeshift brushes, which under no circumstances will give complete satisfaction. Both the process, the resulting picture, and the temper of the bromoiler will suffer unless the process is conducted on the right lines from the start. The brushes that are employed are specially made of black springy hair and are dome-shaped at the ends, with somewhat short hairs ; that is to say, the extreme ends of the brushes are spread out larger than the part that is fastened to the handle. This gives a stub-ended appearance which enables them to be used with a direct, nearly vertical dabbing action. The end or working base of the brush should be smooth to the touch, almost like a little round pad of velvet. Most of the brushes have the ends cut at an angle, so that instead of the dabbing action being direct up and down, a slight forward and downward motion can be imparted. The brush is shaped practically like a horse's hoof, and the action of a horse's hoof striking the ground when walking describes, more or less, the action of the bromoil brush when pigmenting.

We suggest that the three brushes obtained by the beginner should be an inch, half an inch, and a quarter of an inch in diameter across the end. If you can afford it, buy a bigger one still, as the big brushes are more easy to work and produce a finer finish when broad masses are being dealt with.

In addition to the ink and brushes, a little medium will be necessary. This can be ordinary oil painters' megilp or, as some bromoil workers prefer, litho varnish, which must be used very sparingly. In most cases, however, the ink is supplied in tubes of the right consistency for immediate use ; that is, it is a little stiffer than ordinary artists' oil colour. If it is too stiff owing to its being slightly dried up, a little meglip should be added to soften it. The litho varnish has a tendency to make the pigment work more stiffly.

A flat piece of glass or opal is required for use as a palette. An old glass negative makes an excellent palette after the film has been cleaned off. If this piece of clear glass is placed on a sheet of white paper, it enables the appearance of the ink to be judged better. These items, together with the pigmenting pad made of wet blotting paper, as described above, are practically all the accessories necessary for the production of the finished bromoil print.

PIGMENTING THE PRINT.

To start pigmenting, squeeze a little of the pigment from the tube on to the palette. We will assume that you are using black. Also on another corner of the palette deposit a little spot of megilp. Now observe the surface of the bleached print which is lying on thc pad. This should have no obvious traces of water upon its surface, as any splashes or beads of moisture which may be left there will prevent the application of the pigment at that spot, and should be carefully blotted off. The surface of the print, when viewed at an angle, should show a very good indication of the picture, the high-lights being shiny and the shadows dull, representing those portions of the film which have absorbed water in greater or less degree, as described previously. The parts that

have absorbed most water, *i.e.*, the high-lights, will naturally refuse to take the greasy pigment more than those parts which have not absorbed much water, *i.e.*, the shadows. With a strong subject the picture should still be visible in a faint brownish-grey tone.

A little of the pigment is now taken up on the tip of an old thin table knife, which should be kept for the purpose, although a proper artists' palette knife would be better. This is smeared on the palette, and if the ink is very stiff a little of the megilp is smeared with it. The largest pigmenting brush is taken and held between the thumb and the two first fingers of the right hand. To arrive at the correct method of holding the brush, pick it up halfway down the handle and hold it lightly in the same position that you would a pen or pencil for writing or drawing. Then tilt it in the fingers so that, instead of the wooden end pointing back over your shoulder, the handle becomes vertical, with the head of the brush pointing straight down. The thumb should be straight and at right angles to the shaft of the brush, the first finger slightly bent, and the second finger nearly straight. The brush should not be *gripped* by the fingers, but held poised in the finger tips. This, with slight modifications, is the correct position in which to hold the bromoil brush, coupled with the slight forward dabbing action that is assisted by the hoof-shaped cut of the brush itself.

Dab the brush on to the smear of pigment on the palette, and keep on dabbing until a level tone has been produced on this part of the palette. Do not dab too hard—just a " pecking " action that will enable the extreme tips of the hairs to get well covered with pigment. After dabbing for a little while, it will be found that the ink which was spread on the palette has been largely taken up and evenly distributed over the surface of the brush. Now start pigmenting the print with the brush fully charged. Choose a portion of the subject which you know contains a shadow in juxtaposition with a high-light, and pigment just at this spot. If the bleached print is in proper condition, the ink of the right consistency, and the dabbing action correctly performed, it will

be found that the ink immediately adheres to the shadow portion and distinctly refuses to stick to the high-lights. Hence the choice of this particular spot, as it will clear your mind at once as to what is going to happen. If the instructions given so far have been carried out carefully, there is not the least reason why the pigmenting performance should not be successfully accomplished at the first time of asking.

The process consists now merely of transferring a sufficiency of the pigment from the palette to the surface of the print. This sounds simple enough, and after a very little practice it is so. The skill of the bromoil worker, however, develops with his increased practice until he is able by judicious brush action and the application of more or less pigment to build up or " physically develop the image in any desired place that the composition may demand. It will be found that a slow " pressing " movement of the brush will deposit more pigment, and if dealing with a shadow the more the brush charged with pigment is applied with this caressing action to this part of the print the heavier the tone will become. On the contrary, a quick " hopping " movement, in which the brush is literally " hopped " or bounced smartly on to the surface of the print, will remove the pigment ; so that with this means of control it is quite possible to lighten or darken any particular tone or mass of tones in any part of the print at will.

HINTS FOR SUCCESSFUL WORK.

Care should be taken when approaching the edges of the print not to get the brush wet by letting it work over the edge on to the damp blotting paper. Otherwise, if this part of the wet brush is transferred to the print it will immediately remove the pigment already applied and the work will have to be done over again. It is always as well, therefore, when making a bromide enlargement for the purpose of bromoiling, to allow a little margin to the print that need not be pigmented.

Two points that the beginner has to remember when pigmenting a bromoil are—first, do not be in too great a hurry. Do

not imagine that it is possible without a considerable amount of practice and knowledge to apply the pigment so rapidly to the surface of the print that a finished picture can be produced in less than no time. Secondly, do not be afraid to apply plenty of pigment, provided, of course, that it has been well smoothed down to a level tint on the palette before reaching the surface of the print. If this is not done, the print when dry will be very disappointing and look thin, yellow in tone, and gritty; whereas if plenty of pigment is applied and the surface of the print is thoroughly well " worked," a smooth even texture of tone should be produced which will dry with a fine surface, retaining a complete range of gradation. Do not be afraid, therefore, when pigmenting the print to go over the surface again and again with just a trace of ink on the brush. This constant and steady action all over the surface will gradually fine up all irregularities and allow the pull of the bleached image beneath to assert itself. Use the largest brush as much as possible for applying the ink. Keep the smaller ones for " clearing up " high-lights by hopping or for placing local touches of tone.

When using a new brush, and at other times also, it will frequently be found that hairs and specks of grit and fluff, etc., get on to the surface of the print, and for the time being mar the work. No attempt should be made, however, to remove these whilst working on the damp surface with the pigment, as there is always a danger of spoiling the work and injuring the delicate gelatine film. Unless the hair or other foreign matter can be lifted off very easily with a touch of the brush itself, leave it where it is until the print is dry, when it will be found possible to remove all these flaws very readily indeed. The brushes can be cleaned with a little petrol or benzine after use, or with soap and water. In the latter case they should be allowed to get quite dry before pigmenting again.

FINAL TREATMENT OF PRINT.

After the pigment has been applied, the print should be lifted from the wet pad and placed on a sheet of clean dry blotting paper

to harden overnight in a warm room free from dust, or pinned up by the corners in the same way as with a wet bromide enlargement, taking particular care that nothing comes in contact with the pigmented surface, as it can be very easily damaged or smeared. The drying process can be hastened considerably if the print is pinned up to dry over a mantel of a fireplace in which a good fire or gas stove is burning, so that the print comes in a direct current of warm air. In this way it is frequently possible to dry a bromoil print in an evening. Otherwise, if this cannot be accomplished, it is as well to allow at least twenty-four hours to elapse before attempting to touch the surface, or the pigment will not have had time to set and may easily be abraded. Under ordinary circumstances it will take two or three days for the pigment to dry quite hard, but before that happens a little attention may be paid the print for the removal of hairs and foreign matter referred to above. These can be neatly picked or scratched off with a small lancet or lancet-point (used for retouching), which is obtainable from photographic dealers and sold for the purpose. Small irregularities can be very gently scraped down with the keen edge of the little blade, used at right angles to the surface of the paper, and finally, when the dark spots have been cleared away, any light spots can be filled in with a small sable or camel's-hair brush and a little Indian ink, which should be worked down with water to a light tint to match the general tone of the print. Little touches here and there will level the surface up, and the print should then be allowed to harden still further before trimming and mounting in the usual way.

BROMOIL-TRANSFER.

A further development of the Bromoil process, and one that in the hands of the pictorial worker is capable of giving results of the greatest beauty, is the Bromoil-Transfer process. This method, as its name indicates, is one whereby the entire pigmented image of the bromoil print is transferred to another paper support, and it is in the choice of this paper support that a further variety of effect can be introduced, so that the finished result is practically an oil-pigment picture on plain paper.

Special roller presses have been introduced for the production of oil-transfer prints, but it is quite possible to secure excellent results with the domestic mangle or wringing-machine.

It is important, in making bromoil-transfers, that the print should be made a trifle smaller than the bromide paper; and to be quite sure of securing a white margin all round the subject itself it is as well to carefully mask the sheet of paper at the time the enlargement or print is made, so that a narrow white margin of $\frac{1}{8}$ in. or $\frac{1}{4}$ in. is left on all four sides. The necessity for this will be seen later.

Previous to pigmenting the print, the piece of paper to which the picture is to be transferred should be prepared, *i.e.*, damped. This is a very important part of the procedure and upon it depends much of the success or failure of the transferring, and it is difficult to describe the exact condition of dampnessne cessary. It must certainly not be *wet*, but at the same time must be evenly and palpably damp to the hand when touched. The correct condition is best secured by placing the sheet of paper (which should allow for a fair margin round the size of the picture which will be transferred to it) between several sheets of damp blotting paper under slight pressure.

Almost any good variety of drawing paper is suitable for the purpose of making bromoil-transfers, and the sheet should remain between the damp blotting paper until it is in the correct condition for transferring. Take care that it does not get cockled or it becomes difficult to effect a good transfer. The pressure on the damp blotting paper should not therefore be so great as to prevent expansion of the paper. In the meantime, while this is being done, the bromide print is being pigmented. This should be carried out with due regard to the fact that the whole of the ink will not necessarily transfer to the new support, and the print should therefore be pigmented rather on the heavy side. But take care that the pigmenting is not too coarse in texture.

The pigmenting should be done as rapidly as possible, as it is necessary to transfer the image while the bromoil is still fully

damp and the ink unset. When the pigmenting is complete, the white margin of the print referred to above should be carefully cleaned with a piece of damp rag, leaving a clean straight edge to the print and a white margin all round it. The reason for this is obvious, as when the picture is transferred it is necessary that it should have a clean square edge on its new support ; and it will, of course, be very difficult to trim the edges of the wet print and nearly as difficult to pigment the print completely up to the edges if the image extended so far. The method suggested therefore is the best, particularly as the clean margins will leave what is equivalent to a plate-mark surrounding the picture, after it has been transferred, and will considerably enhance its appearance.

To prepare for transferring, it is necessary to have two sheets of stiff, smooth strawboard or stout cardboard at least twice as long as the longest way of the print and of sufficient width to go easily through the mangle or wringing machine. Two sheets of zinc or other thin stout metal are also an advantage ; and to complete the outfit, for the best results a piece of thick " printer's blanket " should be procured. This is very useful in equalizing the pressure when the rollers of the mangle are at all worn or uneven. Assuming that a sheet of zinc has been secured, this should have a perfectly smooth, clean surface and on this the piece of damp transfer paper is laid. The wet bromoil is then taken (after the edges have been cleaned up) and carefully laid face downwards in the centre of the paper or adjusted in the desired position so that there is more space below than above the picture. A sheet of clean, smooth blotting paper is then placed on the back of the print and this is vigorously rubbed to remove any superfluous moisture which may be adhering to the back of the print. The blotting paper is then replaced by another dry sheet of blotting paper and on this should be placed the printer's blanket and finally the second sheet of cardboard or zinc. If the rollers of the mangle or press are in good condition, this bromoil-transfer " sandwich " can now be passed slowly through the machine with good pressure and as slowly back again (hence the necessity for the cardboard to be at least twice the length of the print). If, however, the rollers are

uneven, some extra " printers' blanket " may be necessary to go through with the " sandwich " to equalize the pressure.

The cardboard and blotting paper should now be very carefully removed and one corner of the bromoil print carefully lifted with the point of a penknife and quickly peeled off from the transfer paper, when it will be found that practically the whole pigment image has been transferred to the new base. If, after a few experiments, it is found that the transfer print is not strong enough in the shadow tones, it is quite an easy matter to transfer a second or even a third coating. This is secured by lightly marking the position of the corners of the bromoil print on the transfer paper (before completely removing the print) with a very finely pointed pencil. When the bromoil has been removed, soak it in water again for a minute or two, and replace it on the pigmenting pad. Then, after blotting the surface, re-pigment. This need not be so thoroughly done as the first pigmenting, and in some cases only the shadows need be pigmented at all. In fact, the second pigmenting ought not to take more than ten minutes. It is then replaced on the transfer paper (which may in the meantime have been replaced between the damp blotting paper to keep it in good condition) so that it exactly occupies the position it held previously. This will be found quite easy to do if the pencil marks are carefully observed. It is then treated to a second pressure and generally this will be found sufficient to secure a rich and strong transfer.

The process lends itself obviously to still further adaptations and developments in the matter of producing sketch-like results and pictures in colour, and is one worthy of the attention of every pictorial photographer for the beauty, permanence and individuality of the results obtained.

Development Formulae.

RECENT MODIFICATIONS.

IN compiling the formulæ given in the preceding pages an attempt has been made towards simplification and economy. No useful purpose is served by an array of imposing-looking bottles—often filled with oxidized solutions—on the dark-room shelves. Pyro is obviously suitable for plate development only, but if metol-hydrokinone is used there is no reason whatever why the same developer should not serve alike for plates and papers. The metol-hydrokinone formula given in this book is the same for plates, films, Lantern plates, S.C.P. Lantern plates, S.C.P. and bromide paper. It can also be used for B.B. paper, although a better result will be obtained with the special formula recommended. It will be noted that in certain cases the stock solution has to be diluted with an equal volume of water.

The Borax-M.Q. formula is also capable of almost universal application, and for this reason the stock solution should be prepared without bromide, the quantity of this salt required in certain cases being added from a 10% solution.

Chemicals.

THE nature and the purity of the chemicals used for photographic purposes have a very great influence upon the quality of the results obtained, an influence which many photographers do not fully appreciate. In the case of some of the chemicals employed, there is also a risk that, owing to the rather loose way of naming them, there may be a misunderstanding as to the precise substance that is meant. To guard against both these risks as far as possible, the following list, which contains most of the chemicals referred to in the foregoing notes, arranged in alphabetical order, has been prepared. Against each such particulars as it is desirable that the photographer should know have been given.

Before making up any formula in the preceding pages, therefore, its components should be turned up in the list.

Where it is stated that a substance keeps well, it is assumed always, unless the opposite is stated, that it is kept in a properly stoppered bottle. The only obvious exception that might be made to this rule, is the case of hypo ; and even hypo keeps better, with less risk of impurity, in a corked jar than loose in a paper bag.

Before any liquid is applied to a plate or paper, it is most important to see that all the ingredients are completely dissolved. Minute particles of amidol, metol, etc., undissolved in a developer cause black spots. Fine particles of developer dust, pyro, metol, amidol, etc., floating in the air of the work-room, also give rise to spots if they settle on any sensitive plates or paper.

All WELLINGTON Chemicals are tested for photographic suitability before being placed on the market. They may be relied upon to be of the highest quality obtainable and the worker can employ them with absolute certainty that none of his results will suffer by their use.

ALUM.—There are many forms of alum known to chemists, but the word " alum " by itself means potash alum. It is sold in crystals or in powder form. There is no need for photographic alum to be specially pure, the ordinary quality does quite well. Alum dissolves much more easily in hot than in cold water.

Chrome Alum is a deep purple crystalline salt. Its solution is purple by reflected and reddish by transmitted light. It exercises a more intense hardening action than potash alum.

AMIDOL (or Diamidophenol, to give it its correct chemical name).—This is generally in the form of a fine grey powder, which dissolves readily in water or in a solution of sodium sulphite. Amidol keeps fairly well in powder form, but in solution for a few days only. With age amidol becomes darker in appearance, but some samples are normally much darker than others. The amidol powder should always be kept in a well corked or stoppered bottle.

AMMONIA (also called liq. amm. fort., or ·880 Ammonia, the ·880 referring to its specific gravity).—This should be a clear water white liquid, with an intense ammoniacal smell. It is so strong that it is dangerous to smell at a bottle of ammonia, and if the eyes are brought near an open bottle, they suffer severely. It should be kept in a stoppered bottle, and, except that every time the bottle is opened the liquid gets a little weaker, it keeps indefinitely.

AMMONIUM BROMIDE (otherwise known as bromide of ammonia). —This should be a coarse white powder, which dissolves very easily in cold water. It is not likely to be met with in an impure form and keeps very well both solid and in solution. The bottle in which the powder is kept should be well corked.

AMMONIUM CARBONATE (also known as carbonate of ammonia and lump ammonia).—This should be in the form of tough waxy looking white lumps, with not more than a slight coating of white powder on the outside. A little extra should be allowed when weighing out and the white powder rinsed off. Ammonium carbonate does not keep very well, either solid or in solution, and neither should be used if kept more than three months. The quality stocked by most druggists is pure enough for photography.

Ammonium Sulphocyanide (sulphocyanide of ammonia, ammonium rhodanate).—This is usually sold in small wet-looking crystals, which will keep fairly well in a bottle with a tight-fitting stopper, but in any other case will rapidly absorb moisture from the air, the result being a wet mass, which cannot be weighed accurately. It is therefore easiest to at once dissolve the quantity bought in cold water (it is very soluble), adding water until the bulk of the solution is ten ounces for every ounce of the sulphocyanide crystals dissolved. In the foregoing formulæ ten minims of this solution can then be substituted for each grain of the sulphocyanide prescribed. This solution keeps well.

Citric Acid.—Sold both in powder and crystals. Either will do. In the solid form citric acid keeps indefinitely, no special precautions being required.

Copper Sulphate (otherwise blue vitriol or sulphate of copper). —This salt should take the form of clean-looking deep blue crystals. It should be bought, preferably, at the chemist's, as the quality sold at oil shops is often very impure. It keeps perfectly in the solid form. In solution it gradually goes cloudy in appearance, but this does not interfere with its use. Hot water may be used to dissolve it.

Ferric Ammonium Citrate.—Most chemists keep this salt in the form of brown scales ; there is a green variety, which is said to be better suited for photographic purposes, but the brown will be found to answer all requirements. It is not likely to be impure. It keeps very well, either in the dry state or in solution.

Gold Chloride (otherwise chloride of gold).—As this is an expensive salt, it is good economy to buy only the best quality. It is sold sealed up in glass tubes, each containing fifteen grains. As only a grain or two is wanted at a time, and it is not convenient to weigh out such small quantities, it is best kept in solution, in a stoppered bottle. The tube, having previously been freed from any adherent labels, is dropped into the bottle or measure, and broken either by shaking or by striking with a glass rod. Fifteen drams of distilled water are then added and the solution is ready. If

the tube is broken in the bottle which is to contain the solution the fragments of glass may be allowed to remain ; they will do no harm. As the fifteen drams of solution contain fifteen grains of chloride, each dram of the solution contains a grain, and in any of the preceding formulæ where one grain or two grains of gold chloride are prescribed, one dram or two drams of this solution may be used instead. Thus prepared, gold chloride solution keeps indefinitely. Impurities in the water may spoil it, which is indicated by a black sediment settling down at the bottom of the bottle. It is for this reason that the use of distilled water is recommended.

Hydrokinone (sometimes called quinol).—This is sold in tiny needles or crystals of a greyish white colour, and keeps in the solid form very well. It is not likely to be impure.

Hypo (sodium hyposulphite, hyposulphite of soda, sodium thiosulphite).—This should be in the form of clear transparent crystals or a coarse white powder, and free from smell. It keeps indefinitely both in solid form and in solution, and readily dissolves in hot or cold water. As the dissolving of hypo cools the solution very greatly, warm water should be used, or the solution prepared some time before it is required, in order that it may regain a normal temperature. If this is not done, fixing may be very sluggish and blisters may be caused.

Iodine.—Blue black lustrous scales describes the appearance of iodine. It should be kept in a stoppered bottle. It stains what it touches brown, but the stain can be removed with a little sodium sulphite solution.

Lead Acetate (also known as acetate of lead, or sugar of lead).—This is generally sold in a coarse white powder. It is very poisonous. It is soluble in water, but the solution is usually milky in appearance. Is not likely to be impure.

Metol (monomethyl paramidophenol sulphate) is a white powder, which is freely soluble in water. If it is bought in the makers' bottles it is not likely to be other than in good condition. It keeps in the solid form very well, and in solution with sodium sulphite, etc., for as long a time as any developer.

Nitric Acid (otherwise known as aqua fortis).—This should be a colourless fuming liquid. It is but little used in photography. Being very corrosive it should be kept in a stoppered bottle. The ordinary quality answers every photographic purpose.

Potassium Bichromate (also called red chromate of potash and potassium dichromate).—This is sold in the form of fine orange-red crystals. It keeps well both in the solid form and in solution.

Potassium Bromide (otherwise bromide of potash).—This should either be in the form of a coarse white powder, or crystals mostly cubical. It is very soluble, keeps well in the solid or in solution, and is not likely to be met with in an impure state.

Potassium Carbonate (also called carbonate of potash).—This is a coarse white powder, which must be kept in a well-corked bottle, or it will absorb moisture from the air, cake hard and finally turn liquid. In solution it keeps well, but its solutions should not be put in stoppered bottles, as it makes the stoppers stick. It is best to get " photographic " quality, as some of the commercial carbonate is very impure.

Potassium Citrate (otherwise neutral potassium citrate or citrate of potash).—This is a granular white powder, which is very soluble in water. It is not likely to be met with in an impure condition.

Potassium Ferricyanide (ferricyanide of potash, red prussiate of potash).—This salt is sold in ruby red crystals, which should be clean and bright and free from any orange-coloured powder or dust. It must not be confused with potassium ferrocyanide, yellow prussiate of potash, a salt which occurs in large lemon yellow crystals and is seldom used in photography. The ferricyanide keeps very well in solid form, fairly well in solution, but this depends largely on the purity of the water used to dissolve it. The *best* quality of ferricyanide should be obtained, as some of the commercial samples are anything but pure.

Potassium Hydrate (otherwise called caustic potash).—This is sold in white, hard sticks, which must be kept well corked

up or they attract moisture to such an extent as to liquefy. " Pure " should be asked for. Solutions of potassium hydrate should not be kept in stoppered bottles, as they make the stoppers stick. Except for moisture, this substance keeps well in solid form and in solution.

Potassium Iodide (otherwise known as iodide of potash).—This salt is sold in the form of opalescent white crystals, generally more or less cubical in shape. It is not likely to be impure, is readily soluble in cold water and keeps well (in a stoppered bottle), both in the solid form and in solution.

Potassium Metabisulphite (sometimes called metabisulphite of potash).—This salt should take the form of small, sharp-angled crystals, generally with a slight coating of a white powder upon them. This powdery layer should not go very far into the crystals, and may be removed by washing, as described under the head of sodium sulphite. The metabisulphite met with is generally sufficiently pure. It is not very soluble, and should be dissolved in cold or tepid water, as hot water drives off some of the sulphurous acid, as can be smelt, which is the active part of the salt from the photographer's point of view. It keeps fairly well in a properly corked or stoppered bottle, both in crystals and in solution.

Pyro (also called pyrogallic acid, pyrogallol).—This is sold in a fine, snow-like powder, also in very fine small crystals and in larger crystals. The former dissolves most readily ; the two latter are more easily weighed out. When bought it should be quite white. Pyro keeps indefinitely in the dry form, and for a considerable period in solution if sulphite or metabisulphite is present. Its solution goes darker with age, and when black and thick is useless.

Silver Nitrate (nitrate of silver).—The quality known as re-crystallized should be asked for, and should be in the form of transparent flat-shaped crystals, with little or no white powder amongst them. Silver nitrate keeps very well in solution or in the solid form. When dissolved in ordinary water there is usually a slight cloudiness formed, but this can be ignored.

Sodium Bicarbonate (otherwise bicarbonate of soda).—

The salt is too well known to need description here. It is only used in photography in very small quantities to neutralize any acidity in the gold chloride solution and in the hypo solution used for self-toning paper. The ordinary household quality answers every purpose.

Sodium Bisulphite (also called acid sulphite of soda).—This should be in the form of fine white crystals.

Sodium Bisulphite Lye.—A concentrated solution of sodium bisulphite saturated with sulphurous acid gas. Principally manufactured for use in bleaching works, and employed in photography for compounding acid fixing baths.

Sodium Carbonate (called also carbonate of soda, but must not be confused with the bicarbonate, which is quite a different substance. Washing soda is impure sodium carbonate).—This is usually met with in the form of perfectly clear dry glassy crystals, which is the form referred to in the formulæ in this book. The crystals should be kept in a well-corked bottle or they go powdery and white, and should not then be used. The salt is readily soluble in hot or in cold water. Its solutions will keep in good condition for a long while, but should not be put into stoppered bottles, as they make the stoppers stick. Another form of sodium carbonate on the market is called "anhydrous sodium carbonate." This is a fine, white powder. It can be substituted in any of the foregoing formulæ by multiplying the quantity of the carbonate crystals specified by five and dividing the result by fourteen. The result is then the corresponding quantity of the anhydrous.

Sodium Sulphide (not to be confused with sodium sulphite or sodium sulphate).—What is known as pure crystallized sodium sulphide is the substance referred to under this name. It is generally to be met with in large, greenish white, wet-looking crystals, having a most offensive smell of rotten eggs. As it rapidly absorbs moisture from the air it should not be kept in stock for any long period. In concentrated solution it will keep for a few months.

Sodium Sulphite (also called sulphite of soda, not to be confused with sodium sulphide, or with sodium sulphate).—This

is one of the most important chemicals the photographer uses. It should be, when bought, in clean waxy-looking crystals, with no white powder on them or loose in the bottle. If there is much of this white powder the sulphite has been badly kept. It must be kept in a well-corked bottle, as in the air it rapidly spoils, passing to a white powder, which is quite useless photographically. Sulphite soon dissolves in cold water, and still more readily in warm water. When very hot water is poured on crystals of sulphite, they go a quite opaque white before dissolving, but this change is not harmful. If a bottle of sulphite is opened, a little taken out, and the rest is not likely to be required for some time, it is well to melt the end of a candle over the top of the bottle to seal it up. It then keeps very well. If the sulphite crystals have a coating of white powder on them, but are clean and bright underneath, a little extra may be allowed in weighing out, the crystals given a rinse in cold water for a moment to remove the powder, this water thrown away, and the washed crystals dissolved in the usual way. This should always be done when making up an amidol developer if the sulphite is not quite clean. There is also on the market " anhydrous sodium sulphite." This is a fine, white powder and weight for weight is twice as strong as the crystals. The formulæ in this book are all for crystallized sulphite. If the anhydrous sulphite is to be used, one-half as much as is stated will be correct. Stock solutions of sulphite must not be kept.

Sulphuric Acid.—This is an almost water-white liquid, extremely corrosive and caustic, and should be handled with great care, as it will " burn " anything it touches. When mixed with water great heat is generated. The acid should always be added slowly to water, not water to acid.

Thiocarbamide.—This is a white powder not likely to be met with in an impure state.

Weights and Measures.

THE general custom in formulæ is to use the word ounce to imply the apothecaries' ounce of 480 grains, but if the worker seeks to buy an ounce of any chemical from his chemist he will be served with the avoirdupois ounce of 437½ grains. Hence arises a little inconvenience, since an ounce avoirdupois as bought is insufficient to make up a formula in which an apothecaries' ounce is prescribed. Fortunately for the photographer it is only rarely that the difference of approximately ten per cent. between the two " ounces " is likely to appreciably affect his results. In this book, whenever absolute accuracy is desirable, grains are specified instead of fractions of an ounce. In the case of pyro, which is usually sold in ounce bottles, it will be sufficient if the whole ounce is dissolved as bought, and most formulæ are based on the assumption that this will be done.

A most convenient way of measuring small quantities of chemicals such as potassium bromides is by means of percentage solutions. It will be sufficient for all practical purposes to consider a one, five or ten per cent. solution as one in which one, five or ten units by weight of a salt are dissolved in water (or other liquid) to make 100 units by volume of solution. For example, a ten per cent. solution is one in which 1 ounce (480 grains) is dissolved in water to make 10 ounces (4,800 minims) of solution. Then every ounce of this solution will contain 48 grains of the salt, every dram 6 grains, every 10 minims 1 grain and every minim (or drop) $\frac{1}{10}$ grain.

In this book the quantities given in the metric system are not the equivalents of the corresponding quantities in the British system. The proportions are approximately the same, but the quantities have been arranged so that the bulk shall be the most convenient in each system.

Water is given in fluid ounces.

BRITISH MEASURES.

APOTHECARIES' WEIGHT.

(By which formulæ are made up.)

20 grains = 1 scruple.
3 scruples = 1 drachm = 60 grains.
8 drachms = 1 ounce = 480 ,,

AVOIRDUPOIS WEIGHT.

(By which chemicals are sold).

437½ grains = 1 ounce.
16 ounces = 1 pound = 7000 grains.
¼ ounce = 109 grains (approx.) ; ½ ounce = 219 grains (approx.)
¾ ounce = 328 grains (approx.).

FLUID MEASURE.

60 minims = 1 drachm.
8 drachms = 1 ounce = 480 minims.
20 ounces = 1 pint (in U.S.A. 16 ozs. = 1 pint).
2 pints = 1 quart = 40 ounces.
4 quarts = 1 gallon = 160 ounces.

THE METRIC SYSTEM.

There are three principal units, namely, the metre, the litre and the gramme, the units of length, capacity and weight respectively. Multiples of these units are obtained by prefixing to the names of the principal units the Greek words deca (10), hecto (100), and kilo (1,000) ; the sub-multiples or divisions are obtained by prefixing the Latin words deci ($\frac{1}{10}$), centi ($\frac{1}{100}$), and milli ($\frac{1}{1000}$). These prefixes form the key to the whole system.

LINEAR MEASURE.

10 millimetres = 1 centimetre = ·3937 inches.
10 centimetres = 1 decimetre = 3·937 inches
10 decimetres = 1 metre = 3·281 feet.

MEASURES OF WEIGHT.

10 milligrammes	=1 centigramme		=	·1543 grain.
10 centrigrammes	=1 decigramme	=100 milligrammes	=	1·543 grains.
10 decigrammes	=1 gramme	=100 centigrammes	=	15·432 ,,
10 grammes	=1 decagramme		=	154·323 ,,
10 decagrammes	=1 hectogramme	=100 grammes	=3 ozs.	227½ grains
10 hectogrammes	=1 kilogramme	=1000 ,,	=35 ozs.	87½ grains.

FLUID MEASURE

1 cubic centimetre (c.c.)				=17 minims.
10 ,, centimetres	=1 centilitre			=170 ,,
10 ,, centilitres	=1 decilitre	= 100 c.c.		=3·52 fl. ozs.
10 ,, decilitres	=1 litre	= 1000 c.c.		=35·2 fl. ozs.

The gramme is the unit of weight ; it is the weight of 1 cubic centimetre of distilled water at its temperature of maximum density, 39·1 Fahrenheit. The kilogramme therefore is the same weight as a litre of water.

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